AQUATIC LAND BOUNDARIES IN WASHINGTON STATE

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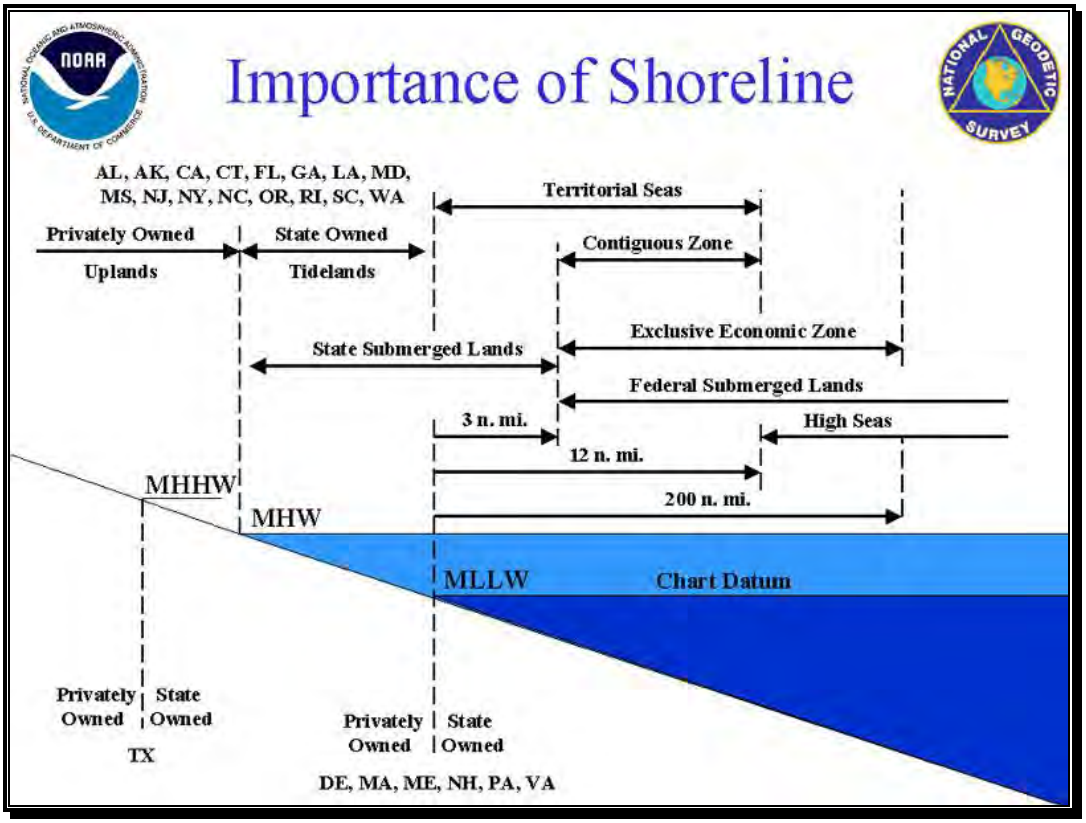

Figure: Shoreline boundaries for various states. Courtsey of NOAA, Department of Commerce

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Chapter 1: Introduction

Water boundaries are probably the most frequently and bitterly contested boundaries. Because the land/water interface is dynamic, attempts to precisely locate water boundaries become a complex and legal quagmire. Unlike most other land boundaries that are 2 dimensional, water boundaries also include a height dimension and a time dimension. Consequently, unique laws and techniques have developed for defining and locating water boundaries.

The determination of water boundary lines between adjacent property owners or adjacent political boundaries is confusing. The legal aspects and laws controlling riparian rights differ materially from state to state. The conveyance of title frequently contains a reference to water boundaries with varying terms. The result is the courts and land surveyors are called upon from time to time for precise and workable interpretations of these vague and ambiguous phrases.

Within the State of Washington, those lands managed by the Department of Natural Resources are defined within RCW 79.02.010, which include public lands, state lands, and aquatic lands. Some terms to be familiar with are as follows:

"Public lands" means lands of the state of Washington administered by the department including but not limited to state lands, state forest lands, and aquatic lands.

"State lands" includes: school lands for the support of the common schools; university lands for university purposes; agricultural college lands for the use and support of agricultural colleges; scientific school lands for the establishment and maintenance of a scientific school; normal school lands for state normal schools; capitol building lands for the purpose of erecting public buildings at the state capital for legislative, executive, and judicial purposes; institutional lands for state charitable, educational, penal, and reformatory institutions; and land bank, escheat, donations, and all other lands, **except aquatic lands**, *administered by the department that are not devoted to or reserved for a particular use by law*.

"Aquatic lands" means all state-owned tidelands, shorelands, harbor areas, and the beds of navigable waters as defined in chapter 79.105.060 RCW that are administered by the department. In Washington State, aquatic lands consist of three general classes depending on their physical and geographic characteristics: tidelands, shorelands, and the beds of navigable waters. Specialized categories of aquatic lands consist of oyster lands, harbor areas, and waterways.

Chapter 2: History of Aquatic Lands

Transfer of Ownership of the Submerged Lands to the States

After the American Revolution, the thirteen original colonies became sovereign states, and were vested with title to all lands within their boundaries that the tide ebbed and flowed over and to the beds of inland navigable waters. (*Shivley v. Bowlby, 1894)*. With the adoption of the Federal Constitution, the states continued to own their tidelands and exercised authority over the lands and the waters beyond the tidelands extending to the State boundaries.

New states entering the Union were admitted on an Equal Footing with the original states and therefore acquired the same right in submerged lands. In *Pollard's Lessee v. Hagan,* 44 U.S. 212 (1845), the Supreme Court held that:

> First, the shores of navigable waters, and the soils under them, were not granted by the constitution to the United States, but were reserved to the States respectively.
>
> Secondly, the new States have the same rights, sovereignty, and jurisdiction over this subject as the original States. This concept is commonly called the "equal footing doctrine".

However, each state has dealt with their submerged lands according to its own views of justice and policy, so a study of the applicable state laws is necessary. The laws of the federal government must resolve any questions regarding the passage of title from the federal government to a patentee, but once the title is passed, the property is subject to state legislation.

Assertion of Ownership by the State of Washington

At statehood, the authors of the Washington State Constitution debated what to do with aquatic lands. They were greatly concerned about the possibility of a few people or corporations monopolizing harbors, which were essential to the economic health of the young state. They decided that most of this great resource should remain in public lands, as described in two key constitutional provisions.

First, the state asserted ownership to all bedlands, tidelands, and shorelands of the state. On November 11, 1889, the entry into the union by the state of Washington was approved. Within the State Constitution, there is a declaration of ownership within Article XVII, Section 1, which reads:

> "The state of Washington asserts its ownership to the beds and shores of all navigable waters in the state up to and including the line of ordinary high tide, in waters where the tide ebbs and flows, and up to and including the line of ordinary high water within the banks of all navigable rivers and lakes: Provided, that this section shall not be construed so as to debar any person from asserting his claim to vested rights in the courts of the state."

Followed by the declaration of ownership was Section 2, which was a Disclaimer of Certain Lands, which reads:

> "The State of Washington disclaims all title in and claim to all tide, swamp and overflowed lands, patented by the United States: Provided, the same is not impeached for fraud."

This Disclaimer of Ownership was to protect certain pre-statehood patents that may have included lands below the line of ordinary high water and to protect previous federal grants for tribal reservations. After statehood the federal government no longer held in trusts the beds and shores of navigable waters, therefore any additional federal patents issued would carry title only to the water's edge.

Second, the authors provided for a commission to establish harbor areas in navigable waters along the shores of cities. These harbor areas were and still are to be reserved for landings, wharves, streets, and other conveniences of navigation and commerce. (Article XV) This article also states that harbor areas and the aquatic lands beyond them must never be sold or given away, thereby ensuring that the aquatic lands most necessary for economic activity, would be forever controlled by the state for the benefit of the entire public.

Two other Constitution articles include provisions related to aquatic lands. Specific to Indians and Indian tribes, the WA Constitution includes a Compact with the United States that the State disclaims all right and title to unappropriated public lands lying within the limits of lands held by any Indian or Indian tribe (Article XXVI, section 2). This provision would apply to aquatic lands lying within a Tribal reservation, subject to, further interpretations of Executive Orders that establish and describe the bounds of reservation lands.

Specific to laws and acts by the Territorial government in the Territory of Washington, laws in force in the Territory would remain in force until they expire, or altered, or repealed by the legislature. (Article XXVII, Section 2) But this section also included a provision applicable to aquatic lands, which states: "Provided that this section shall not be so construed as to validate any act of the legislature of Washington Territory granting shore or tide lands to any person, company or any municipal or private corporation."

State-owned Aquatic Lands

The majority of aquatic lands owned by the state are managed and controlled by the Department of Natural Resources (DNR) under the administration of the Commissioner of Public Lands. The Department is responsible for managing approximately 2.6 million acres of state-owned aquatic lands. These aquatic lands include tidelands, shorelands of navigable rivers and lakes, beds of marine and fresh waters, lands in harbor areas and waterways, and even some filled aquatic lands which now look like uplands.

Chapters 79.105 through 79.140 of Title RCW 79 were created for the purposes of interpreting the Public Lands Act, which include the legislative direction for the administration of aquatic lands. Although the Department of Natural Resources has general authority to manage aquatic lands, other state agencies may exercise administrative control over certain aquatic lands devoted to a particular purpose.

The Constitution makes no statement supporting or prohibiting the sale of the state's tidelands and shorelands; that decision was left to the state Legislature. Between the 1890s and 1950s, the Legislature promoted the sale of these lands to encourage economic development and help fund state government. Most of the state's tidelands and much of the state's shorelands were sold into private ownership. By the late 1950s the trend shifted to leasing aquatic lands rather than selling them. While some leasing had been done since statehood, leasing became much more common in order to retain the public land base and to

generate a long-term stream of income to the state, rather than the one-time revenue generated from land sales.

From 1889 to 1971, the Washington legislature authorized the sale of tide and shore lands. In 1971 the Legislature eliminated the sale of tidelands and shorelands except to public entities, and also specified that aquatic lands could not be given away. In 1982, the Legislature reinstated the provision for sale of second class shorelands on navigable lakes. The sale is limited only to the abutting upland landowners and the shorelands must have minimal public value.

Today, only 29 percent of the state's tidelands and 74 percent of the state's shorelands remain in public ownership. With minor exceptions, all of the state's bedlands remain in public ownership. The decision to stop selling state-owned aquatic lands was a major step in the history of managing aquatic resources. It meant that the state would focus on protecting and wisely caring for our state's legacy of aquatic lands, and helped assure that this legacy would exist in some form for future generations.

Chapter 3: Riparian Rights

In many states, upland property owners that abut bodies of water are said to possess riparian rights. Riparian rights can be defined as the right of an upland owner along a water boundary, which relate to the use of the water, ownership of the shore, right of ingress and egress, etc. Typically, riparian rights include the right to construct improvements or to "wharf out," the right to appropriate water, the right to a reasonable flow of water, the right to access the water in common with other riparian owners, and the right to have unimpaired quality of water. These rights generally apply with respect to both navigable and non-navigable waters. The term "riparian" applies to moving waters, such as along rivers, and the term "littoral" applies to still waters, such as on lakes and the ocean and bays, but in many cases the term riparian has been used utilized for all water front owners.

Washington is somewhat unique, having rejected the concept of riparian rights with respect to the navigable waters to which it asserted title under Article 17 of the state's constitution. Immediately following the adoption of this state's constitution, the Washington Supreme Court was asked to determine whether or not upland owners possess any riparian rights with respect to navigable waters. In the 1891 case of *Eisenbach v. Hatfield*, the court's opinion was that the State of Washington rejected the concept of riparian rights by the disclaimer clause in the constitution and by providing a means for citizens to purchases tidelands and shorelands abutting their property. The Court expressed that riparian owners adjoining navigable waters have no special or peculiar rights and to hold otherwise would deny the power of the state to deal with its own property, as it may deem best for the public good. This concept has been adhered to in a long line of the Washington Supreme Court cases that indicate that a conveyance of tide or shorelands was in effect a substitute for the abolition of riparian rights.

Chapter 4: The Importance of Navigability for Title Purposes

What is navigability?

Aquatic lands are owned by the state if it is "navigable" and the lands have not been conveyed into private ownership. Navigability has come to have many meanings depending on whether one is looking at admiralty law, water law, the regulation of interstate commerce, or property law, but a determination of navigability for property title purposes is a question based upon federal law (*United States v. Utah, 1931*).

The concept of navigability has important historical roots. In England, the King owned the soils of any aquatic lands suitable for commerce and transportation, which included all tidal waters and rivers affected by the tides. England's topography is such that all navigable portions of rivers are tidally influenced, so tidal influence was synonymous with navigability. Originally known as the "ebb and flow" test, this principle was also adopted by the original 13 states whose topography was similar to England's in many respects.

When the early courts and settlers in New England tried to apply those rules it became clear that rivers such as the Hudson and the Ohio were clearly navigable even though not tidally influenced. It was not until the westward expansion of the United States that the need to define navigability in more precise terms emerged. The case law that emerged moved away from the "ebb and flow" test to a more practical consideration of the characteristics of a water body in relation to its use for navigation and commerce. What constitutes navigable water cannot be determined by a formula, which fits every type of stream or lake, under all circumstance and at all times; each determination as to navigability must rest on the facts and circumstance of the particular case. The question of navigability in law is a matter to be decided by the courts based upon the facts and conditions in each case.

The Test of Navigability

According to Federal Court cases, the federal test for navigability has been viewed as a liberal test when compared to some state definitions for navigability. The criteria for the federal test were developed from several landmark U.S. Supreme Court cases. The cases are in agreement that navigability is a question of fact, but the courts are not clear how much evidence is necessary to satisfy all or parts of the criteria to determine navigability.

The foundation for the federal definition of navigability is based upon the U.S. Supreme Court opinions from *Daniel Ball v. U.S.* case of 1870 and *Montebello v. U.S*. case of 1874. The opinion from *U. S. v. Holt State Bank* of 1926 further established the present day guiding principles for navigability of waters for title determinations. The federal test approved by the court is that rivers and lakes are:

> Navigable in fact when they are used, or are *susceptible* of being used, in their *natural and ordinary condition*, as *highways for commerce*, over which trade and travel or may be conducted in the *customary modes of trade and trave*l on water; and further that navigability does *not depend on the particular mode* in which such use is or may be had – whether by steamboats, sailing vessels, or flatboats – nor on an absence of *occasional difficulties in navigation*, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce.

The federal definition for navigability was expanded over navigable waters by the U.S. Supreme Court case of *U.S. v Appalachian Electric Power Co*. in 1940. The court's opinion upheld the previous leading opinions, but expanded the criteria for a navigability determination to consider:

> "Recreational *craft may be used as an indication* that commercial craft could similarly make use of a water body, but the exclusive use by recreational craft is insufficient evidence."

The most recent impacts come from the opinion issued by *Phillips Petroleum Co. v. Mississippi* in 1988. The court was asked to consider whether 42 acres of tidal wetlands that *were not "navigable in fact"* were nonetheless owned by the state. The court held that all tidally influenced areas were originally acquired by the states upon entering the Union regardless of whether they were navigable, but some states have disclaimed ownership to those areas subject to the ebb flow of the tides. The court noted that the English "ebb and flow" test for title had not been rejected by earlier courts, it had merely been expanded in non-tidal rivers and lakes by reference to the standards of navigation and commerce in fact.

These principals have been adopted into administrative law at Washington Administrative Code (WAC) 332-30-106(41), which state "Navigability or navigable" means that a body of water is *capable* or *susceptible* of having been or being used for the transport of *useful commerce*. Because the question of navigability for most water bodies has not been answered, the State of Washington considers all bodies of water meandered by government surveyors as navigable unless otherwise declared by a court.

In most cases, the Washington definition for navigability appears to follow the federal test for navigability on rivers. For many river's, the Washington Supreme Court has issued opinions that some rivers are not navigable for *general commercial purposes*, which is required for the state to assert a claim of ownership to the bed and shores, but some smaller rivers are considered a "public highway" suitable for *special commercial practices.* Special commercial purposes would include the towing of log rafts by very small tugs or by teams of horses or mules along the riverbank, or to send logs down the river during a freshet, or by using splash dams to release large volumes of water behind the logs.

An important aspect of a State receiving the ownership to the beds of navigable streams at the time of statehood is the determination if a pre-existing grant may have reserved the bed for some other purpose. A navigable water body lying entirely within a previous Federal Grant, such as an Indian Reservation, may have passed the ownership of the bed to the Indian Nation. This determination relies on the terms of the Grant or Treaty.

What do the Courts look for in Determining Navigability?

Federal courts have the final authority to determine navigability when Federal interests are involved, such as uplands with public domain land status, or interstate commerce (see Property Clause, U.S. Constitution, Article 4, Section 3, Clause 2). However, for management purposes, there are times when an administrative determination of navigability of a water body is needed to ascertain whether title to land remains in the United States.

The Army Corp of Engineers and the US Coast Guard prepare administrative determinations of navigability in order to apply their administrative duties over navigable waters of the United States. Also, states, such as Oregon and Washington make administrative determinations of navigability for their management purposes. From the Federal court decisions provided above, an opinion for an administrative navigability determination for land title purposes may be restated as follows:

- "Navigable waters of the United States" are those to which congressional acts apply and they must interconnect to permit navigation to navigable waters in other States or countries. Navigable waters of the United States do not confer title to the soil under those waters to the United States.
- "Navigable waters of the State" are those navigable in law that does not interconnect with navigation in other States or countries. The navigable waters of the State include ownership of the soil under the waters.

Navigability of any body of water is always a question of fact to be established by appropriate evidence. The following elements sound very satisfactory, but it leaves broad leeway in the court's application of the specific facts to a situation. Based upon the principals provided, the many elements considered in determining navigability are:

Tidal Influence: On a river, where is the upstream limits for the ebb and flow of the tides? For example, the upstream limit of tides on the Columbia River is to river mile 110.

Meander Lines: The fact that the General Land Office (GLO) surveys established meander lines along the banks of a river is evidence the river was navigable, but it is not conclusive as to navigability and is evidence only of the surveyor's opinion.

Capacity: Linear measures for capacity on a lake would include the size (area) and ordinary depth; and for rivers the measurements would include ordinary depth and width, with less consideration for the gradient (slope measured by vertical drop per mile).

Capability: Under natural and ordinary condition, the capability for navigation would include the volume of water, the gradient of the river, or obstacles to navigation such as, mud flats, rapids and falls. Rivers with a gradient of less than 10 vertical feet per mile were preferred for steamboat traffic, but gradients as much as 50 feet per mile could be navigated with canoe or row boat. However, rapids or falls will not establish an upper limit to navigability if the river travel is still feasible by portage around the obstacles. The navigability quality of a river need not be continuous, but the periodic use must be of a sufficient duration to serve a useful purpose.

Customary Modes of Trade or Travel: The types of commercial use along a waterway are extremely varied and will depend on the character of the region, its products, and the difficulties or dangers of navigation. Customary modes of travel could be paddle wheel steamers, keelboats, scows and barges, rowboats, canoes, or rafts. Sufficient commerce may be shown by historical uses of canoes or other frontier craft so long as that type of boat was common or well suited to the place and period.

Documented Use: Many early court cases placed greater weight on the capability and capacity of the water body to support commerce and less significance on past or current use of the water body. Actual

use for transportation and commerce will generally serve to establish navigability, even though such use has ceased.

Geographic location: The location of the water body relative to settlement patterns and the proximity to other navigable waters is of extreme importance. If a water body is geographically isolated from habitation and transportation routes and are not likely to be used for commercial trade or travel, they would be considered as non-navigable.

Date of Statehood: Navigability is determined by the condition of the water body as of the date of statehood for the purpose of determining title. A change in navigability subsequent to statehood does not deprive the state of its title.

Artificial Improvements: The types of improvements necessary to make the water body navigable and susceptible to commerce will be considered, but if a water body that can be used for commerce after the construction of reasonable improvements may be found to be navigable.

Chapter 5: Federal Lands and Surveys by the General Land Office (GLO)

With the passage of the "Oregon Donation Act" in 1850, land surveys were authorized to proceed in the Oregon Territory in what are now the states of Washington and Oregon so "orderly settlement" could occur. An initial point for the Willamette Meridian and Baseline was established just south of Portland in 1851. All land surveys in both states were made in reference to this initial point.

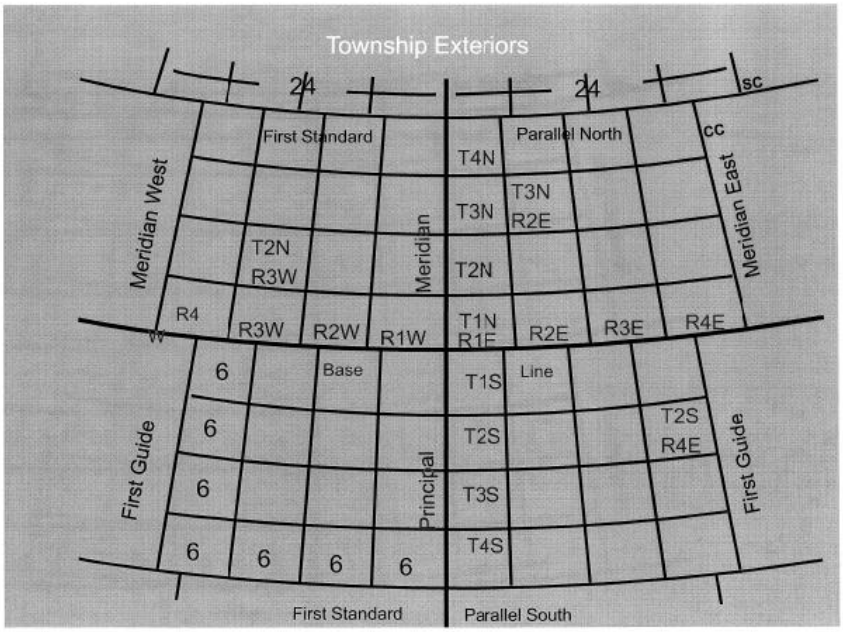


Figure: the layout of townships extending from the initial point.

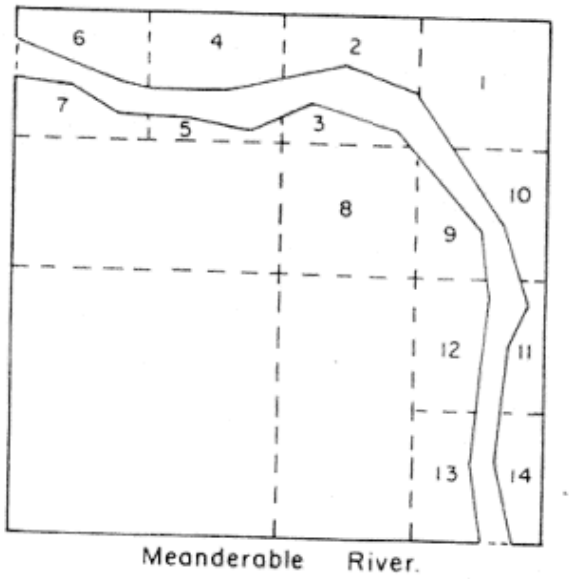


Figure: meander lines are run along each bank of the river.

Non-aliquot parts result when bordering on a water feature and lots were created when the original surveyor was instructed to meander along water bodies. In Section 3-159 of the 2009 Manual of Surveying Instructions, a meander line is defined and explained as follows:

> The traverse that approximates the margin of a permanent natural body of water….is termed a meander line.
>
> …meander lines are run, not as boundaries of the parcel, but (1) for the purposes of ascertaining the quantity of land remaining after the segregation of the bed of the water from the adjoining upland, (2) for defining the sinuosities of the water boundary for platting purposes, and (3) for closing the survey to allow for acreage calculations. The OHWM or line of MHT of the stream, or other body of water, and not the meander line as actually run on the ground, is the actual boundary.

It is important to note the proper terminology when referring to the banks of a stream. When facing downstream, the bank to your left is always referred to as the "left bank" and the bank on your right is the "right bank".

The Federal Intent for the Meander Line

Normally, when the Federal Government conveys title fronting a navigable inland body of water, the intention is that the ownership extends to the ordinary high water mark (OHWM). For lands fronting a non-navigable inland body of water, the intention is that the upland ownership extends to the medial (center) line. Finally, for lands fronting tidal water, the intention is that ownership extends to the line of mean high tide (MHT)…

Federal lands are not conveyed without a survey, selection, or patent and a function of the General Land Office (GLO) survey was to identify important bodies of water. As the surveys encountered navigable water bodies, the instructions to the land surveyor was to measure a meander line along the banks of all navigable bodies of water and other important rivers and lakes. Unfortunately, the precision of the meander line surveys results in a significant problem for the re-establishment of water boundaries. If land was not suitable for cultivation, it was called swamp, marsh, bog, or overflowed lands according to the surveyor's preference.

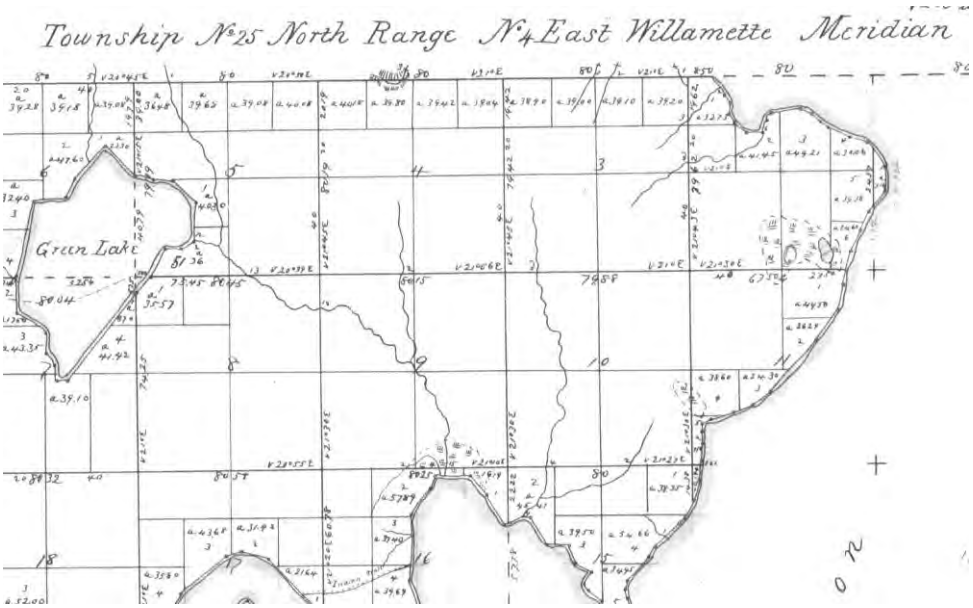


Figure: General Land Office plat for subdivision of fractional sections abutting Lake Washington.

GLO Instructions to the Land Surveyor

Much of the Oregon and Washington territories were surveyed according to various editions of the Manuals of Surveying Instruction. The early instructions to the land surveyor required considerable judgment by the surveyor to decide, which streams, rivers, and lakes were to be meandered. The early manuals instructed the surveyors to meander by "taking general courses and distances of their sinuosities…" Exactly where on the shore they were to meander was not specified in these manuals. An important concept to remember is that the GLO did not include lands not suitable for farming or other uses in the acreage purchased by a settler.

The following table compares the instructions to meander a water feature by each edition.

Manual	Rivers	Lakes	Tidal
1851 Oregon	Navigable streams both banks	In excess of 25 acres	None
1855	Navigable streams both banks	In excess of 25 acres	None
1864 Instructions	Navigable streams both banks & one bank other well defined streams	In excess of 40 acres	None
1881	Navigable streams both banks & one bank other well defined streams	Lakes which may serve as public highways of commerce	None
1890	Navigable streams both banks & streams with right angle width of 3+ chains (198 feet)	In excess of 25 acres	None
1894	Navigable streams both banks & streams with right angle width of 3+ chains (198 feet) at ordinary mean high water mark	In excess of 25 acres	Tidewater streams at OHWM as far as the tide-water extends
1902	Navigable streams both banks & streams with right angle width of 3+ chains (198 feet) at mean high water mark	In excess of 25 acres	Tidewater streams at OHWM as far as the tide-water extends
1930	Navigable streams both banks & streams with right angle width of 3+ chains (198 feet) at mean high water elevation	In excess of 25 acres	Tidewater streams at OHWM as far as the tide-water extends

Key points in the instructions to note are:

In the 1855 and 1871 Manual of Instructions, the surveyor was to meander both banks of navigable rivers and navigable bayous, and to meander lakes or deep ponds greater than 25 acres in size. The manual left the responsibility to the surveyor of determining which rivers were to be meandered.

In the 1881 Manual of Instructions, the surveyor was to meander both banks of navigable rivers; to meander one bank only (preferably the right bank) of any river not designated as navigable, but are “well

defined natural arteries of internal communications"; and to meander lakes, bayous, and deep ponds, "which may serve as public highways of commerce", but the 1881 manual dropped the size requirements for lakes and ponds.

In the 1890 Manual of Instructions, the surveyor was to meander both banks of navigable rivers and bayous; to meander both banks of any river, which was more than 3 chains in width (this would include any rivers considered as not navigability and were not routes of communication), and to meander lakes and deep ponds greater than 25 acres in size.

It wasn't until the 1894 Manual that the term "ordinary mean high water mark' was introduced in reference to freshwater streams, then was modified in subsequent manuals. References to tidal waters utilized the term OHWM, which today we utilize for freshwater streams. Today we utilize MHT for the tidal boundaries.

The Meander Line as a Boundary in Washington

For many pre-statehood land patents in Washington State, the uplands ownership may extend beyond the line of ordinary high water out to the meander line, so the ownership would also include aquatic lands.

Washington has developed the generalized rule that if the uplands abutting a navigable body of water were patented or vested by the United States before statehood, that is November 11, 1889, the upland ownership extends to whichever line is farther out, the line of ordinary high water or the government meander line. This rule is based upon more than 80 years of Washington Supreme Court opinions that have continued to modify how the rule is applied.

In 1892, *Scurry v. Jones* was the first case to recognize the basic rule that all lands within the calls of a patent, lying waterward of the line of ordinary high tide (in Elliott Bay, Seattle), belong to the patentee if the patent was issued prior to statehood. The court's opinion was that the State of Washington had chosen to disclaim lands to the meander line through Article 17, section 2 of the State Constitution and was construed to be a grant by the state for lands patents issued prior to statehood, so long as the patents were not impeached for fraud.

In the 1893 case of *Mann v. Tacoma Land Co.,* the U.S. Supreme Court rejected the above argument for using a meander line based upon the disclaimer clause by stating that a federal land patent can only convey "public lands" which does not include tidelands. Regardless of this U.S. Supreme Court opinion, many Washington Supreme Court cases have continued to modify the meander line rule in subsequent court opinions.

In 1905, the case of *Kneeland v. Korter* further ruled that the Northern Pacific Railway Company was entitled to the benefits of the disclaimer clause of the Washington Constitution, even though the patent was issued after statehood. The court determined that the railroad was entitled to lands granted by the United States prior to admission of the state pursuant to the Act of Congress July 2, 1864. Even though the final selection of railroad grant lands were not completed until many years after statehood, the court

appears to presume that the necessary map for the definite location of the railroad line did precede the date of statehood.

In 1908, the case of *Brace and Hergert Mill Co. v. State* recognized that the meander line rule is extended to include lakes.

In 1958*, Narrows Realty Co. v. State* the court declared that other parties were as much entitled to the benefit of the disclaimer clause because the patentee had received the official receipt of the receiver at the General Land Office in Olympia, WA on March 16, 1883. Upon payment the patentee became entitled to a patent even though the patent was not issued until July 25, 1892.

In 1961, *Stockwell v Gibbons* confirmed that the meander line rule as a boundary for pre-statehood patents was applicable to bays of Puget Sound.

In the 1971 court opinion of *Smith Tug and Barge v. Columbia Pacific Towing Corp*., the court denied the application of the meander line rule, based upon the disclaimer clause in Article 17, section 2 of the constitution, to not be applicable to navigable rivers. Because rivers continually shift and change course, it is impractical to use a fixed meander line as a boundary. Also, the framers of Article 17 never intended to deprive the state of a necessary thing as ownership of the beds of navigable rivers. The court feared that an owner on one bank could claim land by accretion, while the opposite owner could claim ownership by the meander line rule. "If a land owner on one side of the river claims to the meander line by virtue of a pre-statehood patent and the opposing land owner across the river must hold the line of ordinary high water, and the pre-statehood owner loses uplands through erosion as the post-statehood land owner gains through accretion; then at some time the accreted lands could move into and over the pre-statehood patentee."

Summary

As can be seen by the above court opinions, determining the date of the federal patent relative to the date of statehood becomes significant when the title to the upland property does not include the adjoining tidelands or shorelands. Also, most important was the **date the patent was earned** relative to the date of statehood; **not the date the patent** was issued or recorded either of which might have been much later than the date the title was earned.

The resulting generalized rule has evolved from many more court cases resulting in the following application of the Rule:

- The meander line rule applies to lakes and to bays of Puget Sound.
- The meander line rule does not apply to rivers or to the coast of the Pacific Ocean.
- The meander line rule applies to lands granted to the Northern Pacific Railway Company even though the patent was issued after statehood because the railroad was entitled to lands granted by the United States pursuant to the Act of Congress July 2, 1864.

- The issue date of the patent does not control, but the date on the final official receipt of the receiver at the General Land Office determines when the patentee is vested in title. The patent may not be issued for many years (upward of 10 years) after the final payment is completed.

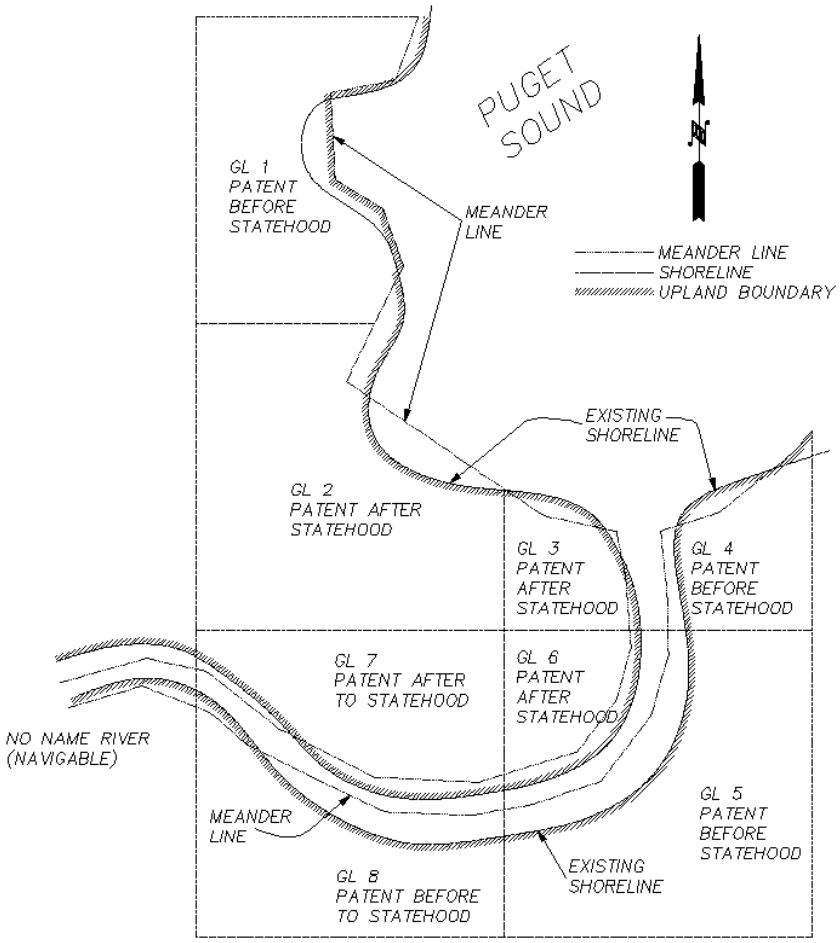


Figure: Example of the meander line as an upland boundary.

Chapter 6: Tides and Tidal Datum

The Tidal Boundary Problem

Most of the original states adopted the English common law where by lands below the average high tide mark belongs to the State. The grants or land patents, which are the first links in the chain of title, frequently reference boundaries such as the high water line, the high tide line, and the line of ordinary high water and also use similar references to the opposite, the low tide line or extreme low tide. As a rule these references are indefinite to the point of ambiguity, primarily because of the inherently complex and variable character of the tidal phenomena. The most convenient method of dealing with the relationships between various phases of the tide is in terms of average or mean values.

Normally the upland boundary is the line or contour along which the substantially horizontal plane of mean high water intersects the sloping surface of the land. We must recall that we are dealing here with two different relationships - vertical and horizontal. If for any reason the elevation of the plane is changed, the contours will shift along the sloping surface of the land. Even though the elevation of the tidal plane remains unchanged, from time to time, there will be appreciable horizontal changes in the position of the line as a result of waves and currents in producing erosion and accretion to the land.

Interpretation of terms

The word "tides" is a generic term used to define the alternating rise and fall in sea level with respect to the land. For the demarcation of tidal boundaries, the usual objective is to determine the location of the mean high tide elevation for the limits of uplands ownership or the mean low tide elevation for the limits of tideland ownership. Because the elevations for mean tide levels vary from place to place and owing to multiple factors, the elevation of a mean tide level is not a true horizontal plane.

Two terms of special significance are "ordinary high tide" and "ordinary high water". Ordinary high tide refers to tidal waters and is equated to mean high tide, which is defined as the average elevation of all high tides at a given location through a complete tidal cycle of 18.6 years. The line of ordinary high tide is where the elevation meets the shore, as it exists at any particular time.

In the United States, not until 1935 did the decision of *Borax Consolidated Ltd. v. City of Los Angeles* apply modern technical knowledge and set forth a workable technique for precisely locating the boundary in question that still prevails in U.S. common law. In this case, the Supreme Court recognized the importance of the averaging of all the high tides during the 19-year tidal datum epoch when determining the mean high tide line. The definition for mean high water represents an attempt to define the upper reach of the daily tide as the boundary between publicly owned submerged lands and uplands subject to private ownership. This compromise line results in a line that is exceeded by the high tide on approximately one-half of the tidal cycles. A majority of the states have adopted the Borax decision that the line of ordinary high water is the interface boundary, but there are exceptions, particularly the six Atlantic coast states, which use the mean low water as the boundary for sovereign lands.

With respect to tidal waters, in 1961 the U.S. Court of Appeals (9^{th}) in *United States v. State of Washington* concluded that:

> In the case of tidal waters, the high water mark means the line of high water as determined by the course of the tides not as determined by physical markings made upon the ground by the water. The court held the boundary between uplands and tidelands to be the present line of mean high tide, defined as the average elevation of all high tides at a given location through a complete tidal cycle of 18.6 years. This is an unchanging elevation and the line of mean tide is where that unchanging elevation meets the shore, as it exists at any particular time.

In 1966, the Washington Supreme Court case of *Hughes v. State of Washington* the court's opinion was that the reference in article 17 of the Washington Constitution to the ownership of tidelands

commencing at the "line of high tide" was construed to mean "the average of all high tides during the tidal cycle." Some portions of the opinions issued in the Hughes case were overruled, but the discussion and interpretation of the line of mean high tide still represents Washington law in this regard.

Tidal Datum Planes

When a position on the face of the earth is described accurately, it must be referenced in terms of latitude, longitude, and height (three-dimensional). This is accomplished by referencing positions in terms of vertical and horizontal datum.

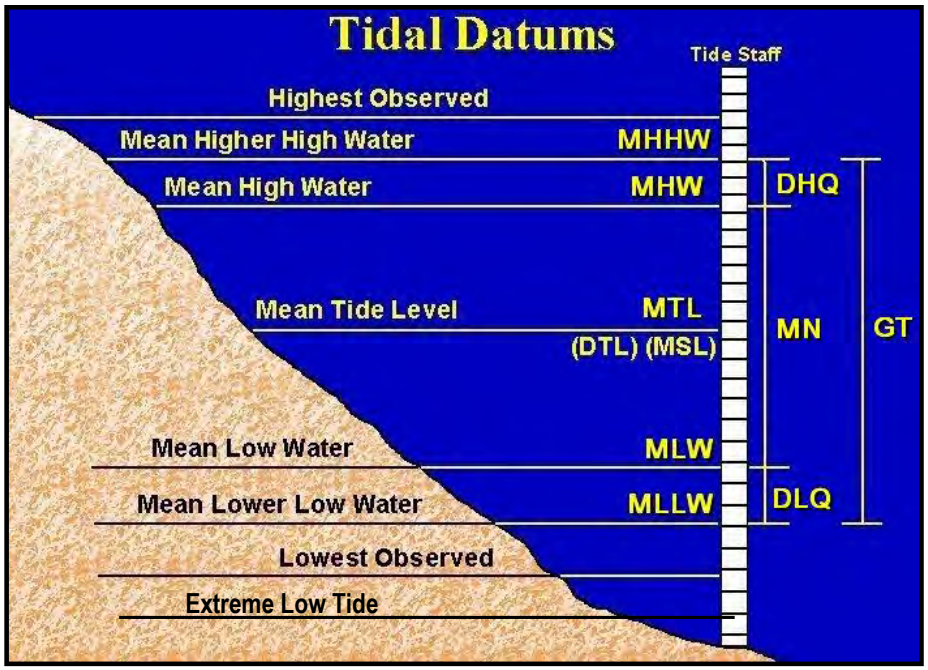
A vertical datum allows a determination of elevation or height above or below a point of reference equal to zero. Traditionally, surveyors and map makers have tried to simplify the task of determining elevation or height by using the average (or mean) sea level as the definition of zero elevation because the sea surface is available worldwide.

Mean sea level is the basic datum for elevation and is the most common datum used prior to the 1930's before the adoption of the NGVD 1929 vertical datum. As a precise datum, mean sea level must be carefully distinguished from half-tide level or mean high tide or mean low tide. The difference in elevation between these datum vary greatly. *Mean sea level is derived by averaging the hourly height of the tide*, while the MHT and MLT are the average of only two 1 or 2 observations occurring each day.

Obviously, the accuracy of the determination for these mean values will depend on the length of the series of observations from which they are derived. A local mean sea level is determined over a specific period of time and should not be confused with other fixed vertical datum. Because there are many variables affecting sea level, the relationship between the geodetic datum and a local mean sea level is not consistent from one location to another in either time or space. A tidal datum is a mathematically fixed elevation of the ocean surface at a particular phase of the tidal cycle.

A tidal datum is a local datum and should not be extended into areas, which have different hydrographic characteristics without substantiating measurements. In order that they may be recovered when needed and be linked to land-fixed horizontal and vertical control points, such a datum is referenced to fixed points known as benchmarks. Tidal benchmarks have been established throughout the tidal waters and are related to the values obtained from tidal readings at those locations.

The National Geodetic Vertical Datum 1929 is a fixed datum adopted as a standard geodetic reference for heights, but is now considered superseded. NGVD 29 is sometimes referred to as Sea Level Datum of 1929. It was derived from a general adjustment of the first order leveling nets, in which mean sea level, was held fixed as observed at 21 tide stations in the United States and 5 in Canada. Remember that the NGVD 1929 is not equal to mean high water (MHW) or to a nautical chart datum, which is mean lower low water (MLLW). For this reason, the National Geodetic Vertical Datum of 1929 should not be confused with mean sea level.



Tidal datum's based upon observations at a local tide gauge.

MLHW & MHLW are not shown.

NAVD 88 is a fixed datum derived from a simultaneous, least squares, minimum constraint adjustment of Canadian/Mexican/United States leveling observations. Local mean sea level observed at Father Point/Rimouski, Canada was held fixed as the single initial constraint. NAVD 88 replaces NGVD 29 as the national standard geodetic reference for heights.

Mean Values for a Tidal Datum

Mean Higher High Water (MHHW) is defined as the arithmetic mean of the higher high water heights of the tide observed over a specific 19-year cycle (the NTDE). Only the higher high water of each pair of high waters of a tidal day is included in the mean. For stations with a shorter series, simultaneous observational comparisons are made with a control tide station in order to derive the equivalent of a 19-year value.

Mean High Water (MHW) is defined as the arithmetic mean of the high water heights observed over a specific 19-year cycle (the NTDE). For stations with a shorter series, simultaneous observational comparisons are made with a control tide station in order to derive the equivalent of a 19-year value. Use of the synonymous term, mean high tide, is discouraged.

Mean Low Water (MLW) is defined as the arithmetic mean of the low water heights observed over a specific 19-year cycle (the NTDE). For stations with a shorter series, simultaneous observational

comparisons are made with a control tide station in order to derive the equivalent of a 19-year value. Use of the synonymous term, mean low tide, is discouraged.

Mean Lower Low Water (MLLW) is defined as the arithmetic mean of the lower low water heights of the tide observed over a specific 19-year cycle (the NTDE). Only the lower low water of each pair of low waters of a tidal day is included in the mean. For stations with a shorter series, simultaneous observational comparisons are made with a control tide station in order to derive the equivalent of a 19-year value.

Mean Tide Level (MTL) is the average of MHW and MLW.

"Extreme low tide" means the line as estimated by the federal government below which it might reasonably be expected that the tide would not ebb. In the Puget Sound area of Washington State, this line is estimated by the federal government to be a point in elevation 4.50 feet (plus or minus 0.5 feet) below the datum plane of mean lower low water, (0.0). Along the Pacific Ocean and in the bays fronting thereon and the Strait of Juan de Fuca, the elevation range is down to minus 3.5 feet in several locations.

National Tidal Datum Epoch

The National Tidal Datum Epoch is the specific l8.6-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for a tidal datum. It is necessary for standardization because of periodic and apparent trends in sea level elevations. The present National Tidal Datum Epoch is 1983 through 2001. It is reviewed annually for possible revision and must be actively considered for revision every 25 years. The National Tidal Datum Convention of 1980 established a uniform system of tidal datum for all tidal waters in the U.S., its territories and trusts; and authorized the NOS definitions of mean high water, mean higher high water, mean low water, and mean lower low water as the official policy of the U.S. Government.

Tidal boundaries are generally defined as the average over 18.6 years of a specified phase of the tide, since it takes 18.6 years to complete a full cycle of the varying relationship among the positions of the earth, sun, and moon. The relationship between the positions of the sun and moon vary and cause changes in the heights and range (distance of rise and fall) of the tides.

Characteristics of the Tides

The difference in the height between consecutive high and low tides occurring at a given place is known as the range. The range of the tides at any location is subject to many variable factors. High tides are produced in the ocean waters by the "heaping" action resulting from the horizontal flow of water toward two regions of the earth representing positions of maximum attraction of combined lunar and solar gravitational forces. Low tides are created by a maximum withdrawal of water from regions around the earth midway between these two humps. The alternation of high and low tides is caused by the daily (or diurnal) rotation of the earth with respect to these two tidal humps and two tidal depressions.

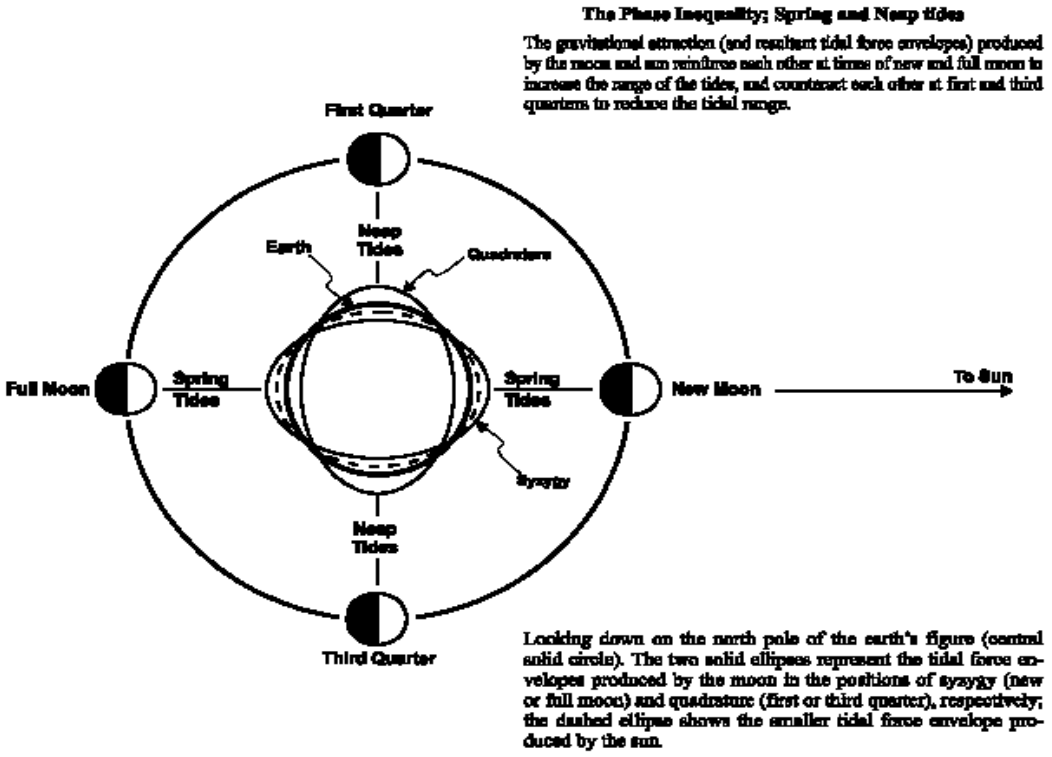


Figure 4. An illustration of solar and lunar tide producing forces. The largest tides, spring tides, are produced at new and full moon. The smallest tides, neap tides, occur during the first and third quarters of the moon.

There are four factors, which unite to produce the daily fluctuations in the elevation of the water surface, which we call the tide. Each factor is complex, and three of the four are variable within themselves. The great complexity and variability of the tide is due to the almost unlimited number of combinations into which these four factors can unite to produce differences at the same time at different points and differences at the same point at different times. These four factors are:

1. The astronomical tide producing forces.

2. The configuration of the major ocean basins.

3. The variable configuration of the shoreline.

4. Non-astronomic factors (essentially meteorological).

Tidal characteristics are affected by the many positions of the earth, sun, and moon, which are in constant motion and their relationships to each other are changing in both direction and distance. Because it is possible to determine the position of the earth, sun, and moon well into the future, predicted tidal charts could be made up many years in advance.

In the open ocean, the actual rise of the tidally induced wave crest is only one to a few feet. It is only when the tidal crests and troughs move into shallow water, against land masses, and into confining channels, that noticeable variations in the height of sea level can be detected.

Topography on the ocean floor can also provide a restraint to the forward movement of tidal waters. Restrictions to the advance of tidal waters imposed both by shoaling depths and the sidewalls of a channel, as these waters enter confined bays, estuaries, and harbors, can further alter the speed of their onshore passage.

Meteorological contributions to the tides are more of a local and sporadic nature, such as "storm surges". These contributions are caused by a continuous strong flow of winds either onshore or offshore and may superimpose their effects upon the tidal action to cause either heightened or diminished tides. Variations in barometric pressure also bring about fluctuations in sea level. When the barometric pressure raises the level of the water will be lowered, while a decrease in the barometric pressure raises the level of the water. Additional factors causing the sea surface height to change include waves, ocean and river currents, ocean eddies, temperature, and salinity of the ocean water.

Types of Tides

There are three basic types of tides. The first type, semidiurnal, has two high waters (high tides) and two low waters (low tides) each tidal day. A tidal day is the time of rotation of the Earth with respect to the Moon, and its mean value is approximately equal to 24.84 hours. The two high waters for each tidal day must be almost equal in height and the two low waters of each tidal day also must be approximately equal in height. The semidiurnal (semi-daily) tides occur when the moon is over the earth's equator plane

The second type is a mixed tide, which occurs when the changing angular distance of the moon is above or below the equator. A mixed tide is similar to the semidiurnal except that the two high waters and the two low waters of each tidal day have marked differences in their heights. When there are differences in the heights of the two high tides then they are designated as higher high water and lower high water. When there are differences in the heights of the two low tides, then they are designated as higher low water and lower low water.

The third type is a diurnal or daily tide, which has one high water and one low water each tidal day.

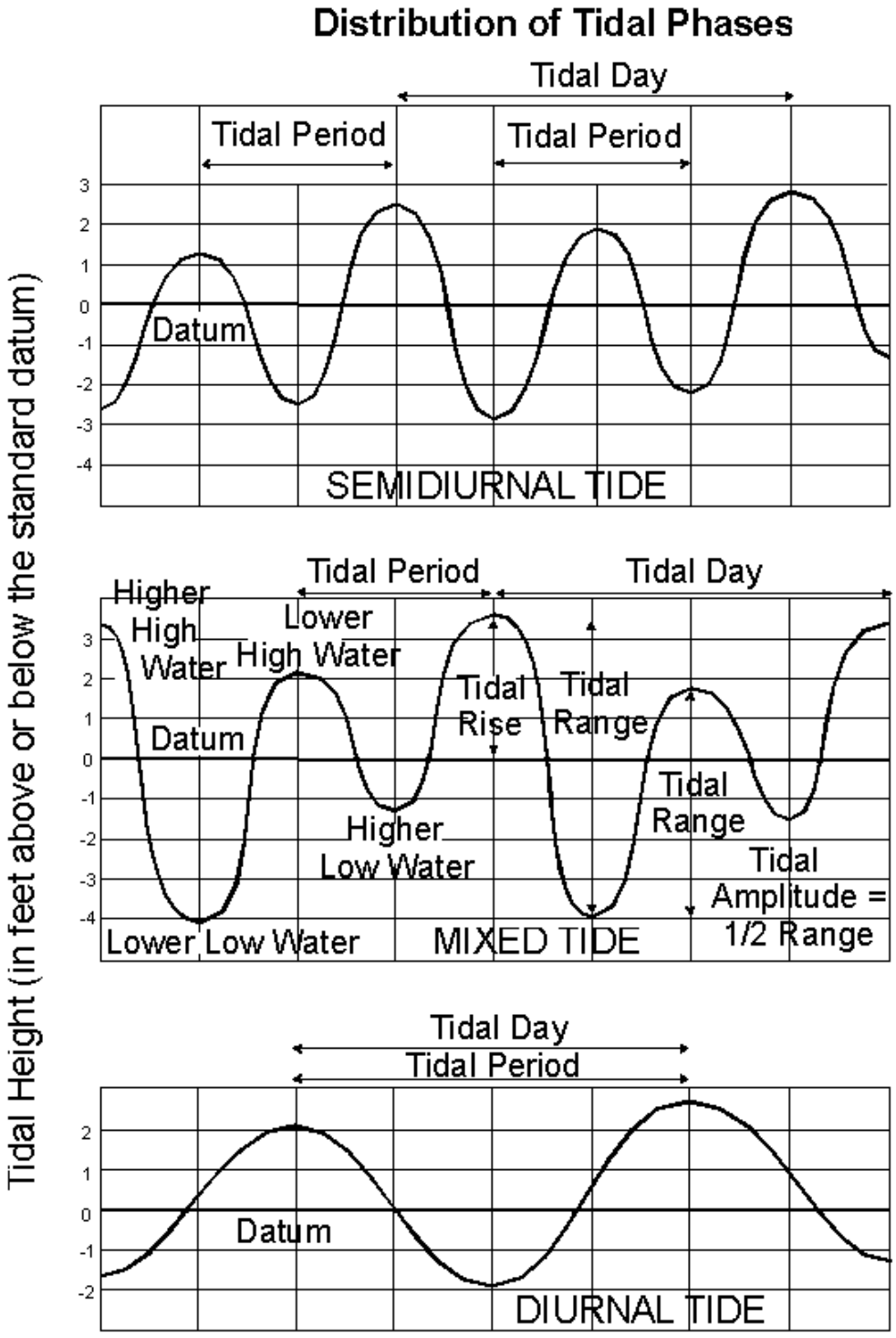


Figure: Types of tides.

Sources for Tidal Data and Mean Tide Elevations

The Seattle District of the U.S.A.C.E. has a listing of tidal datum regions on their web page, which can be found at http://www.nws.usace.army.mil/PublicMenu/Documents/Reg/applications/tides/tides.cfm. A note of CAUTION is required because this web site includes some errors. None of the reports are for the new Epoch 1983-2001 and approximately 50% of the tidal datum reports, in the MLLW column, the elevation for NGVD29 is shown to be zero feet when the actual elevation should vary between 4 and 6 feet. The NGVD zero value should be placed at the intersection of the NGVD column and the NGVD row. Also, many reports have the dates of observation placed in the Epoch date field and the Tidal Datum Region maps show some tidal stations at an incorrect location.

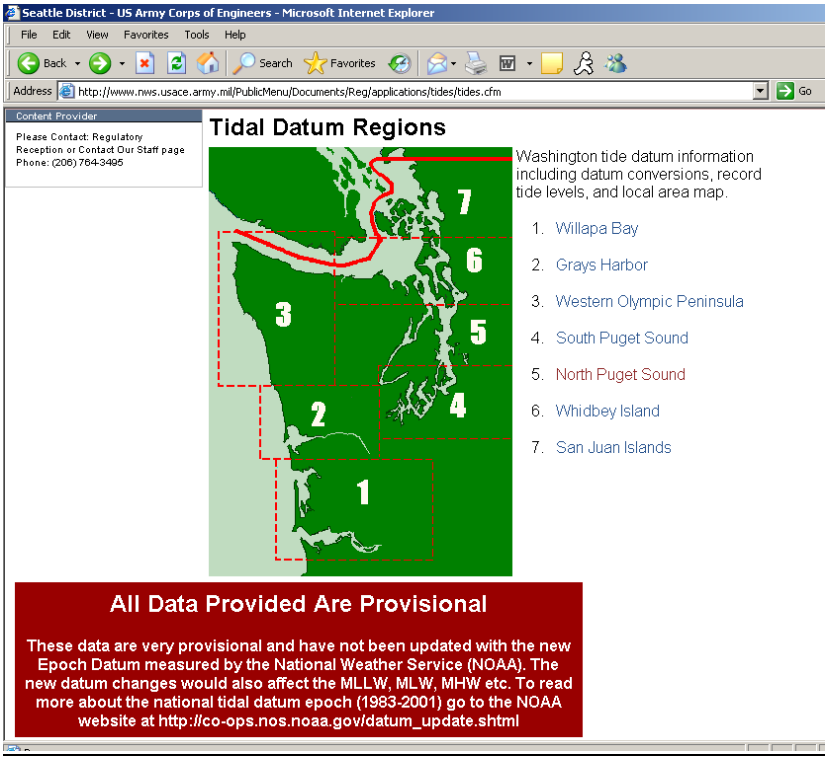


Figure: The Seattle District, USACE tidal datum web page.

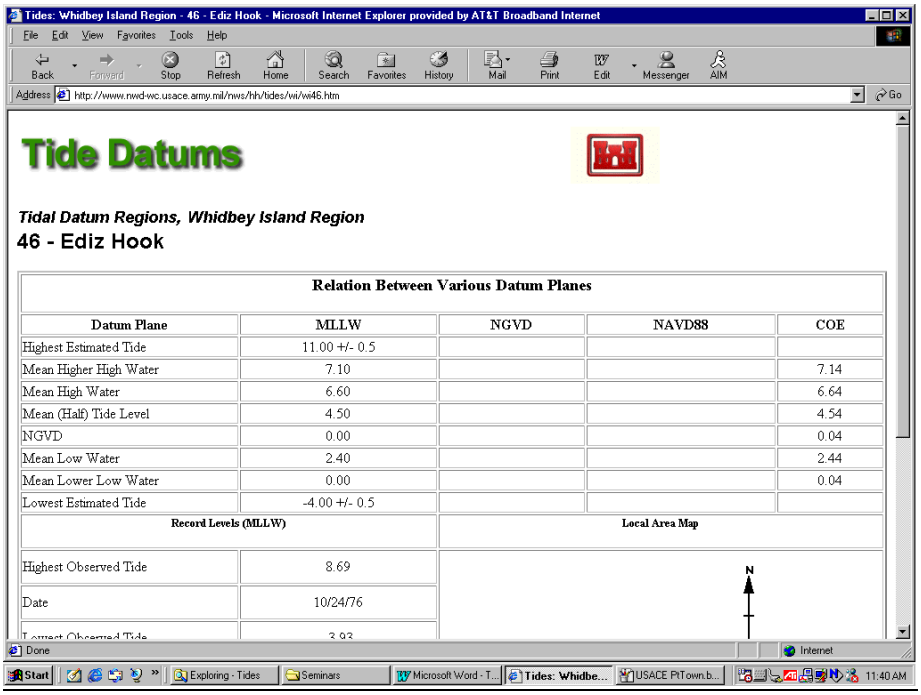


Figure: USACE tidal datum report with the NGVD elevation is shown incorrectly.

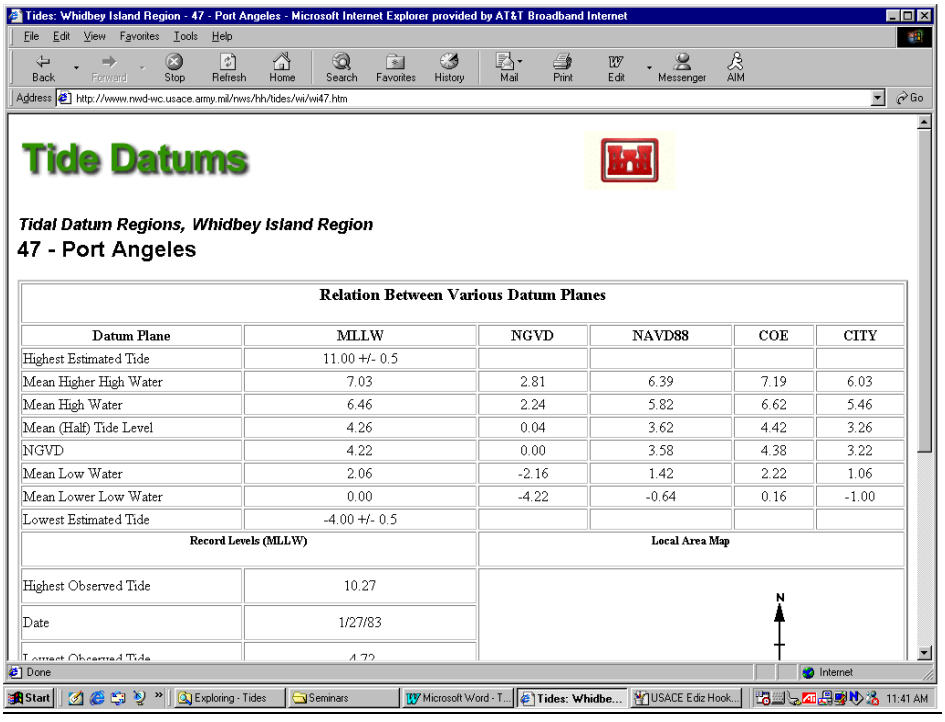


Figure: USACE tidal datum report with the NGVD 29 elevation shown correctly.

The Center for Operational Oceanographic Products and Services (CO-OPS) within the National Ocean Service (NOS) is responsible for the management and operation of the National Water Level Observation Network (NWLON). This network consists of tide and water level gauges installed along U.S. coastlines, estuaries, and bays. There are 189 water level gauge installations along the U.S. coasts, in major U.S. harbors, in the Great Lakes and connecting channels, and in the U.S. territories and possessions. Along the West Coast, there are 26 primary stations with:

1) 14 primary stations located in California;

2) 4 primary stations located in Oregon and;

3) 8 primary stations located in Washington at Toke Point, Neah Bay, Port Angeles, Port Townsend, Tacoma, Seattle, Cherry Point, and Friday Harbor.

Tidal Benchmark Station List

Any survey to determine the location of a contour line representing the local mean high tide or for any of the tidal plane mean elevations require ties to a tidal benchmark. The best source for current tidal benchmark elevations are found at the web site operated by the Center for Operational Oceanographic Products and Services (CO-OPS) within the National Ocean Service (NOS). Users can access and download benchmark descriptions, recovery information, and elevations data at the web site found at http://tidesandcurrents.noaa.gov/.

The NOS station identification numbers are given, along with the common station name, and its latitude and longitude. NOS station identifiers have been assigned using a three-digit number for each state (944 for WA) followed by four digits for the number assigned to that station. The NOS numbers are generally in increments of ten from north to south, or east to west as appropriate, allowing for additional gauges to be added in the future and using the intermediary numbers.

Bench Marks and Differential Leveling

A network of benchmarks is established for every water level measurement station and each tidal benchmark is related vertically to the local tidal datum. At primary control stations, a network of 10 benchmarks is installed in the vicinity of the station; at secondary stations, a network of five benchmarks is installed; and at tertiary stations, at least 3 benchmarks are installed.

A sample page from the published benchmark sheet for Port Townsend, WA illustrates information pertaining to a tidal datum and vertical control. Note that for this station, the tidal datum was computed from a secondary reduction based on the control station indicated (Seattle). The report provides elevations for the mean tidal datum referred to Mean Lower Low Water (MLLW) in Feet, and provide the elevations of the tidal benchmarks in feet above MLLW and above MHW.

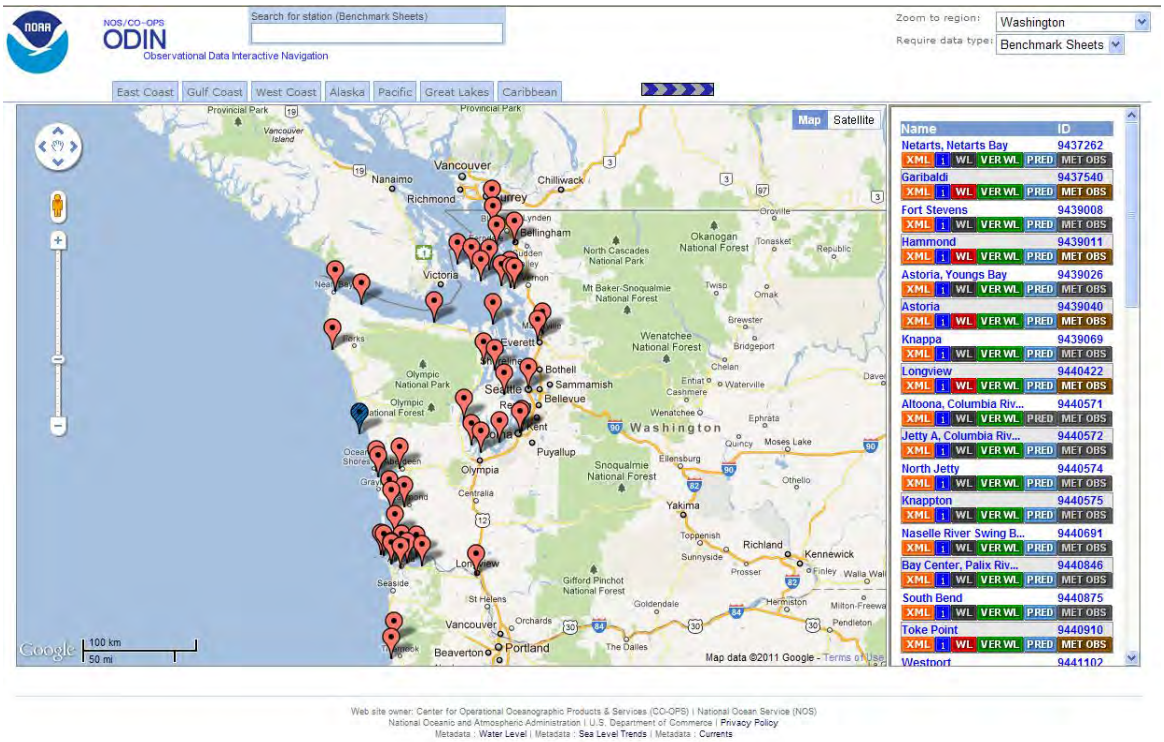
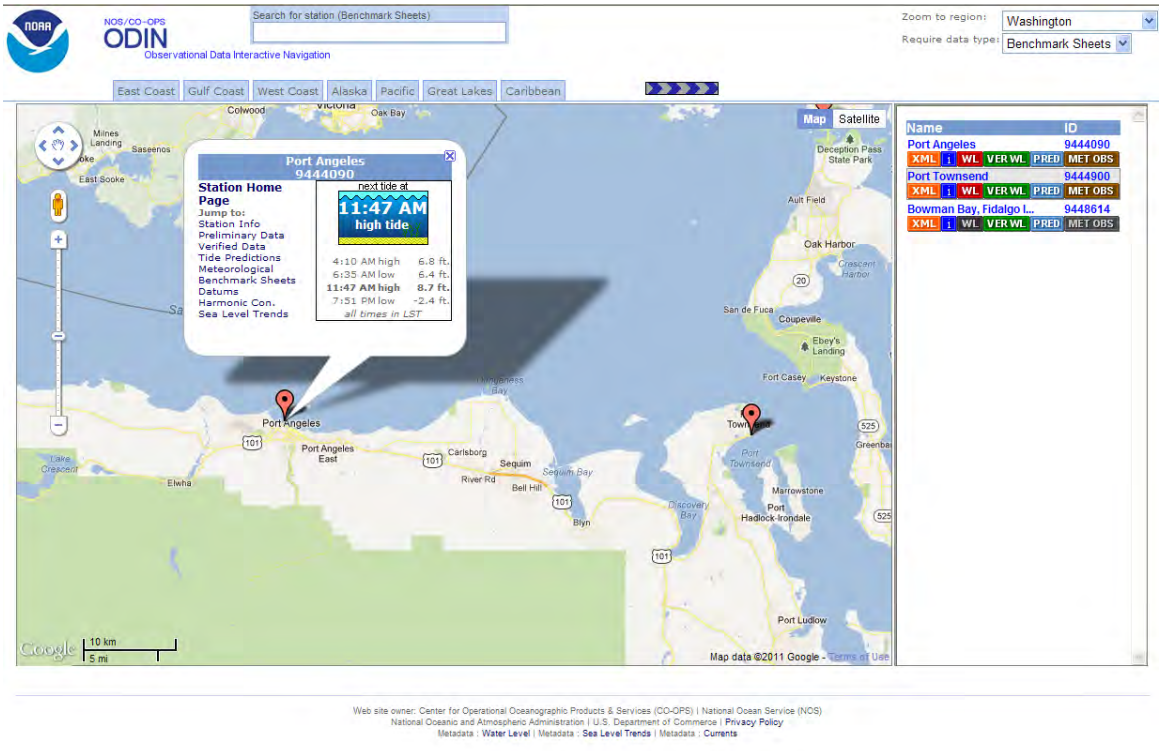


Figure: NOS Web site for Washington Tidal Benchmarks.



Upon examination of the benchmark report, note that all benchmarks have a VM#, but some benchmarks have a PID # that is a hyperlink to the NGS web site. Clicking on the hyper link will retrieve the NGS recovery information, which very often contains a more current recovery note along with horizontal survey control data. The Vertical Mark Number (VM#) and PID# shown on the benchmark sheet are unique identifiers for benchmarks in the tidal and geodetic databases, respectively. Where both VM# and PID# are indicated, both tidal and geodetic elevations are available for the benchmark listed.

Each tidal station page provide multiple links to additional information about the current tidal epoch, the superseded epoch, other datum, mean sea level differences, etc. Not all tide stations will have all of the above links shown above because some tide stations have insufficient data due to the length of observation while the tide gauge was in place.

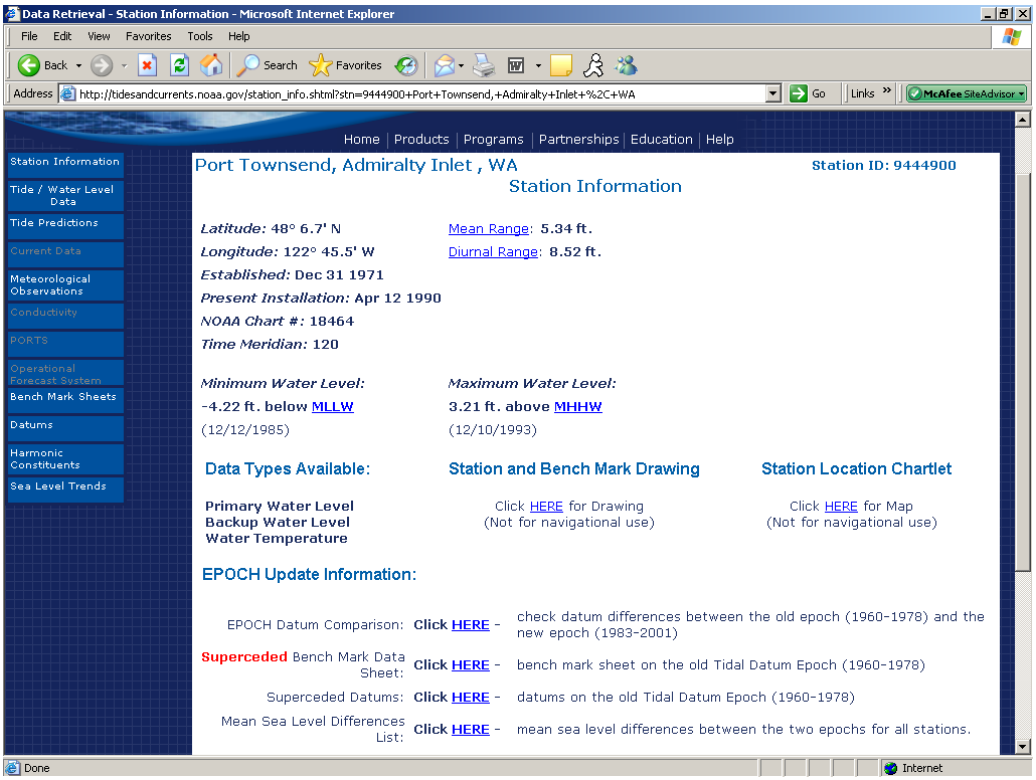


Figure: Port Townsend Station Information

Sample Tidal Station Data: U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Ocean Service

Page 1 of 7

Station ID: 9444900 **PUBLICATION DATE: 10/11/1988**

Name: PORT TOWNSEND, ADMIRALTY INLET WASHINGTON

NOAA Chart: 18464 **Latitude: 48ø 6.9' N**

USGS Quad: PORT TOWNSEND SOUTH **Longitude: 122ø 45.0' W**

To reach the tidal bench marks from the west side of the Hodo Canal Bridge, travel west on Route 104 to the Port Townsend/Chimacum turn-off onto County Road 12, then 14 miles (23 km) to Route 20, turn north and proceed along Route 20 for 4 miles (6 km) into Port Townsend, continue on Water Street (Route 20)to the end of the town and turn east into the Texaco Oil yard. The benchmarks are generally located along Water Street (Route 20) towards Point Hudson. The tide station is located in a 10 x 13-foot (3 x 4 m) wooden house on the unused Texaco Oil pier at Point Hudson.

T I D A L B E N C H M A R K S

PRIMARY BENCH MARK STAMPING:

MONUMENTATION: VM#: 3145

AGENCY: PID:

SETTING CLASSIFICATION:

BENCH MARK STAMPING: NO 9 1952

MONUMENTATION: Survey Disk VM#: 1122

AGENCY: PID:

SETTING CLASSIFICATION: Concrete Foundation

The bench mark is set in the foundation of the concrete wall surrounding the storage tanks at the Texaco Oil yard, 0.7 foot (0.2 m) SW of the SW wall corner, 0.7 foot (0.2 m) west of the west side of the foundation, and 0.3 foot (0.1 m) above ground level.

BENCH MARK STAMPING: R 257 1944

MONUMENTATION: Survey Disk VM#: 1123

AGENCY: PID#:TR0559

SETTING CLASSIFICATION: Brick Wall

The bench mark is set vertically in the south brick wall of the city hall at the Water/Madison Street intersection, 1 foot (0.3 m) NE of the SW wall corner, and 5 feet (2 m) above the sidewalk.

Station ID: 9444900 **PUBLICATION DATE: 10/11/1988**

Name: PORT TOWNSEND, ADMIRALTY INLET WASHINGTON

NOAA Chart: 18464 **Latitude: 48ø 6.9' N**

USGS Quad: PORT TOWNSEND SOUTH **Longitude: 122ø 45.0' W**

Tidal datum at PORT TOWNSEND, ADMIRALTY INLET based on:

LENGTH OF SERIES: 12 YEARS

TIME PERIOD: 1972-1983

TIDAL EPOCH: 1960-1978

CONTROL TIDE STATION: 9447130 SEATTLE

Elevations of tidal datum referred to Mean Lower Low Water (MLLW), in FEET:

HIGHEST OBSERVED WATER LEVEL (12/16/1982)	= 11.77
MEAN HIGHER HIGH WATER (MHHW)	= 8.45
MEAN HIGH WATER (MHW)	= 7.74
MEAN TIDE LEVEL (MTL)	= 5.15
MEAN LOW WATER (MLW)	= 2.55
MEAN LOWER LOW WATER (MLLW)	= 0.00
LOWEST OBSERVED WATER LEVEL (06/02/1973)	= -3.96

Bench Mark Elevation Information In FEET above:

Stamping or Designation	MLLW	MHW
NO 9 1952	11.71	3.97
R 257 1944	20.47	12.73
NO 10 1952	17.26	9.52
TIDAL 13 1972	14.33	6.59
NO. 14 1974	16.37	8.63
TIDAL BM 16 1975	20.95	13.21
TIDAL BM 17 1975	15.98	8.24
4900 A 1978 TIDAL	16.27	8.53
4900 B 1981	11.71	3.97
4900 C 1982	16.49	8.75

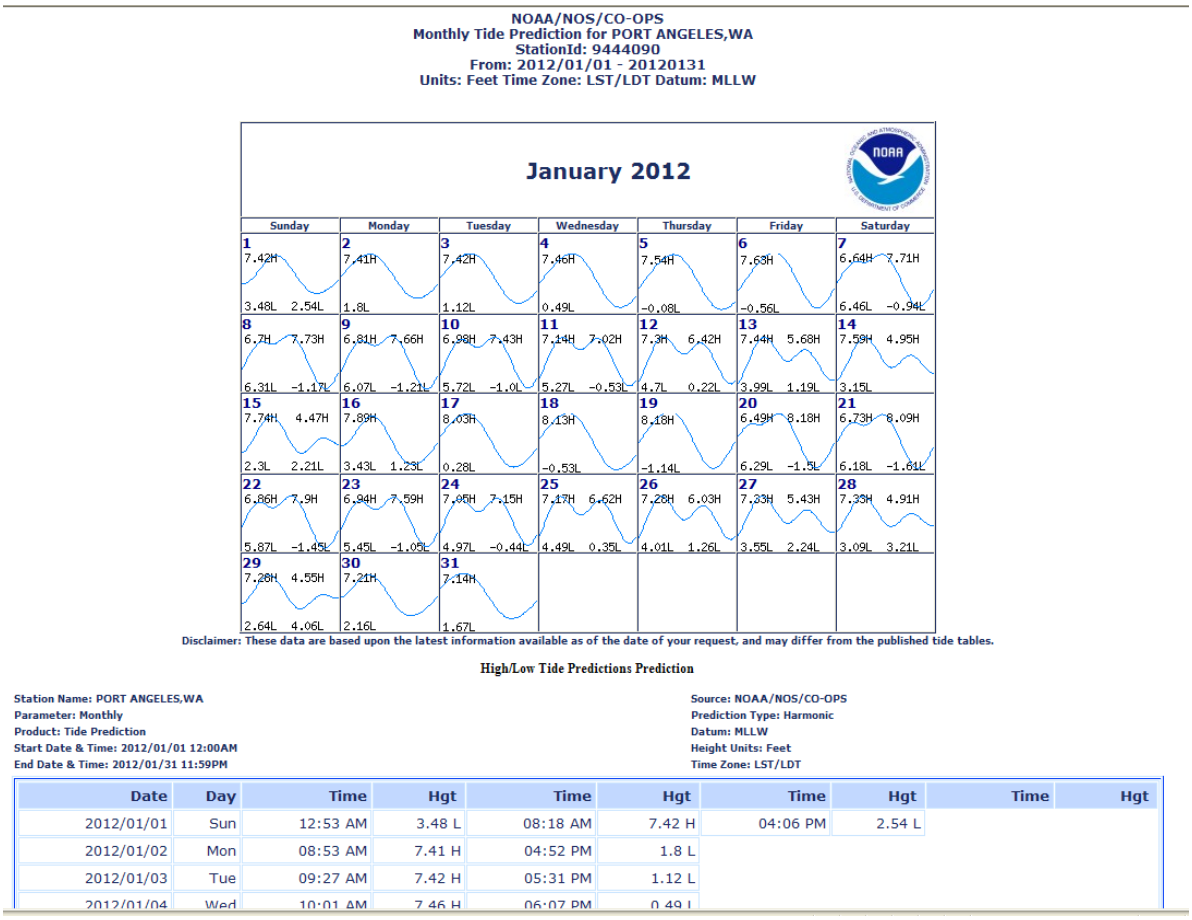
Tide Predictions and Accuracy

Essentially astronomical forces of harmonic nature produce the tides and a definite relationship exists between the tide-generating forces and the observed tides and a factor of predictability is possible. Because of the numerous uncertain and, in some cases, completely unknown factors of local control, it is not feasible to predict tides purely from a knowledge of the positions and movements of the moon and sun obtained from astronomical tables.

Tide tables are based upon the mathematical forecast of the movement of the sun and moon, which can be accurately predicted, BUT the accuracy of the predictions is impacted by local weather conditions (temperature, barometric pressure, and wind) and by the coast line configuration. The predicated tide heights can be as much as 1 foot in error and the predicated tide times can vary by a ½ hour or more. The application of time differences and height ratios will generally provide reasonably accurate approximations for predicted tides, but they cannot result in predictions as accurate as those listed for the reference station.

The new NOS web site that also provide tide predications at the home page for each station found on the interactive map. The page provides predictions for the years 2009 to 2013 at more than 3000 stations around the United States. The predicted heights and times for a specific station have been corrected based upon the reference station for addition or subtraction to the time of arrivals and the multiplication factor for the heights of high and low tide predictions. An older web page for tide predications can also be found at http://tbone.biol.sc.edu/tide/index.html, which provides the predictions as a tidal curve graph for high and low tide cycles and also can provide a tabular list of tide predications at interval from 1 minute to 12 hours.

The time differences and height ratios used to calculate predictions at subordinate stations are derived from a comparison of simultaneous tide observations at the subordinate station and its reference station. The reference stations for Washington State are at Astoria, OR, Aberdeen, Port Townsend, and Seattle. Because these adjustments are constant, they may not always provide for the daily variations in the actual tides, especially if the subordinate station is some distance from the reference station. Therefore, although the application of time differences and height ratios will generally provide reasonably accurate approximations, they cannot result in predictions as accurate as those listed for the reference stations, which are based on much larger periods of analysis.



NOAA/NOS/CO-OPS
Monthly Tide Prediction for PORT ANGELES,WA
StationId: 9444090
From: 2012/01/01 - 20120131
Units: Feet Time Zone: LST/LDT Datum: MLLW

January 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 7.42H 3.48L 2.54L	2 7.41H 1.8L	3 7.42H 1.12L	4 7.46H 0.49L	5 7.54H -0.08L	6 7.63H -0.56L	7 6.64H 7.71H 6.46L -0.94L
8 6.7H 7.73H 6.31L -1.17L	9 6.81H 7.66H 6.07L -1.21L	10 6.98H 7.43H 5.72L -1.0L	11 7.14H 7.02H 5.27L -0.53L	12 7.3H 6.42H 4.7L 0.22L	13 7.44H 5.68H 3.99L 1.19L	14 7.59H 4.95H 3.15L
15 7.74H 4.47H 2.3L 2.21L	16 7.89H 3.43L 1.23L	17 8.03H 0.28L	18 8.13H -0.53L	19 8.18H -1.14L	20 6.49H 8.18H 6.29L -1.5L	21 6.73H 8.09H 6.18L -1.61L
22 6.86H 7.9H 5.87L -1.45L	23 6.94H 7.59H 5.45L -1.05L	24 7.05H 7.15H 4.97L -0.44L	25 7.17H 6.62H 4.49L 0.35L	26 7.28H 6.03H 4.01L 1.26L	27 7.33H 5.43H 3.55L 2.24L	28 7.33H 4.91H 3.09L 3.21L
29 7.28H 4.55H 2.64L 4.06L	30 7.21H 2.16L	31 7.14H 1.67L				

Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Predictions Prediction

Station Name: PORT ANGELES,WA
Parameter: Monthly
Product: Tide Prediction
Start Date & Time: 2012/01/01 12:00AM
End Date & Time: 2012/01/31 11:59PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2012/01/01	Sun	12:53 AM	3.48 L	08:18 AM	7.42 H	04:06 PM	2.54 L		
2012/01/02	Mon	08:53 AM	7.41 H	04:52 PM	1.8 L				
2012/01/03	Tue	09:27 AM	7.42 H	05:31 PM	1.12 L				
2012/01/04	Wed	10:01 AM	7.46 H	06:07 PM	0.49 L				

Figure: Sample tide level predication for Port Angeles, WA.

Tide predications tables are sold through many retail outlets or sporting good stores. The use of these tables is acceptable, but there are some limitations. The tables normally provide predictions for the Washington Pacific Beaches, Seattle for the Southern Puget Sound, and Port Townsend for the Northern Puget Sound. A user of these tables must apply the time and height correction factors to the predictions for any geographic position other than at the reference station. These corrections can be many hours before or after the tide predication for the reference station and the height correction can be as much as 20%, above or below the reference station.

Tide predictions are based upon the analysis of observations at a tide station. Since extremes of meteorological conditions have been excluded from the analysis, the predicted values should be considered as those expected under average weather conditions. Generally, prolonged onshore winds or a low atmospheric pressure can produce higher levels than predicted, while the opposite can result in lower levels than those predicted. The tidal water levels are given in feet above or below Mean Lower Low Water.

The accuracy of the tide predictions is different for each location. Periodically NOS performs a comparison of the predicted tides vs. the observed tides for a calendar year. NOS works to insure that the predictions are as accurate as possible, however, they can only predict the astronomical tides and cannot predict the effects of wind, rain, freshwater runoff, and other short-term meteorological events.

In general, predictions for stations along the outer coast are more accurate than for stations farther inland, along a river, or in a bay or other estuary. Inland stations tend to have a stronger non-tidal influence; that is, they are more susceptible to the effects of wind and other meteorological effects than stations along the outer coast. Stations in relatively shallow water, or with a small tidal range, are also highly susceptible to meteorological effects and thus difficult to accurately predict. At these stations, short-term weather events can completely mask the astronomical tides. Many of the stations along the western Gulf of Mexico fall into this category.

Applications and Surveys Using a Tidal Datum

Tidal datum are chiefly used to determine horizontal boundaries, and for estimating heights or depths. The legal determinations of private and public lands and state owned submerged lands depend on the determination of tidal datum and their surveyed intersection with the coast. To determine the local elevation of mean high water it is important to use an elevation established in the immediate area of the proposed survey.

The procedures for the purpose of locating a structure, a contour, or a boundary related to a specific tidal elevation could use many methods. The methods are as follows:

Direct Use of Tide Station Benchmarks:

The best method for obtaining a tidal datum elevation is the direct use of an existing tide station and the associated benchmarks. When using an existing tide station, at least two benchmarks should be recovered and leveled between to check for mark disturbance, errors in published data, or mark misidentification.

Linear Interpolation between Stations:

In many cases, a tidal station and benchmarks may not be available for surveys that are based upon a tidal elevation, so the use of an alternative method may be considered. For a site located far from an existing tide station, the elevations for a local tidal datum can be obtained by interpolating between tide stations for the elevation of MHT and MLT.

For many tidal stations, a conversion value relating the station benchmarks to the NGVD 29 and NAVD 88 vertical datum have been derived by leveling between the tidal benchmarks and benchmarks previously tied to NGVD 29 or NAVD 88. Once a MHT and MLT elevations are derived for the remote site, an additional linear interpolation is necessary to provide a conversion value to convert from the NGVD 29 or NAVD 88 datum to a tidal datum. A new software tool by NOAA is “VDatum”, which is

designed to transform vertical data between a variety of tidal and fixed elevation datum into a common system. The software can be downloaded at: http://vdatum.noaa.gov/

Tide Prediction Tables:

The use of tide tables may be a suitable alternative method in some situations. The use of tide prediction tables for the establishment of a line for a lease agreement or for a permit application is acceptable, but this method is not appropriate for the establishment of a land ownership boundary. So long as those surveys or legal descriptions that utilize a tide table prediction recognize that error may exist in the survey measurements, then this method is a suitable alternative. The survey must include a note that acknowledges the error and includes a disclaimer that the use of tide-prediction tables is not suitable for land boundary surveys.

Elevations from a Water Surface:

If the tidal elevation data does not need to be precise, an elevation derived by vertical measurements from the water surface can be used, if the surface of the water is flat (no wave movement).

The basic element of this method is that the water itself is used to measure the difference in sea level elevation between that found at a tidal datum station and that sought at another point. When a tide whose elevation is exactly that of mean high tide occurs at a tidal datum station, a mean high tide water line will also occur at other nearby places, and the water line as it exists at other places will mark the mean high tide line.

It is critical when using this method to be within a few miles of the tidal station and that the remote site is in the same general tidal basin. For instance, this method would not work in the case where you would transfer elevations taken from the water surface on the west side of Whidbey Island over to the east side of the island. The system works best in bays or inlets where wave action is slight, and works poorly where the wind is blowing or waves cause a rise and fall of the water line.

Establish additional short-term stations:

When there are no tidal benchmarks available in your area, it might be acceptable to take a series of readings on the surface of the water. Additional tide stations can be established by simultaneous tidal observations between the new station and an established NOS tide station. Observations must be conducted for a minimum of three tidal cycles, but for areas without a dense network of tide stations, it may be necessary to conduct a full month or more of simultaneous observations to achieve a satisfactory correlation. Then by determining the mean of all highs and lows of the tide you could develop your own tidal station for that particular location. It is obvious that the longer period of time spent on this endeavor the results will be more exact. When an additional tide station is established the resulting elevation should be preserved by the establishment of one or more stable benchmarks in the immediate vicinity of the survey.

Chapter 7: Tidelands

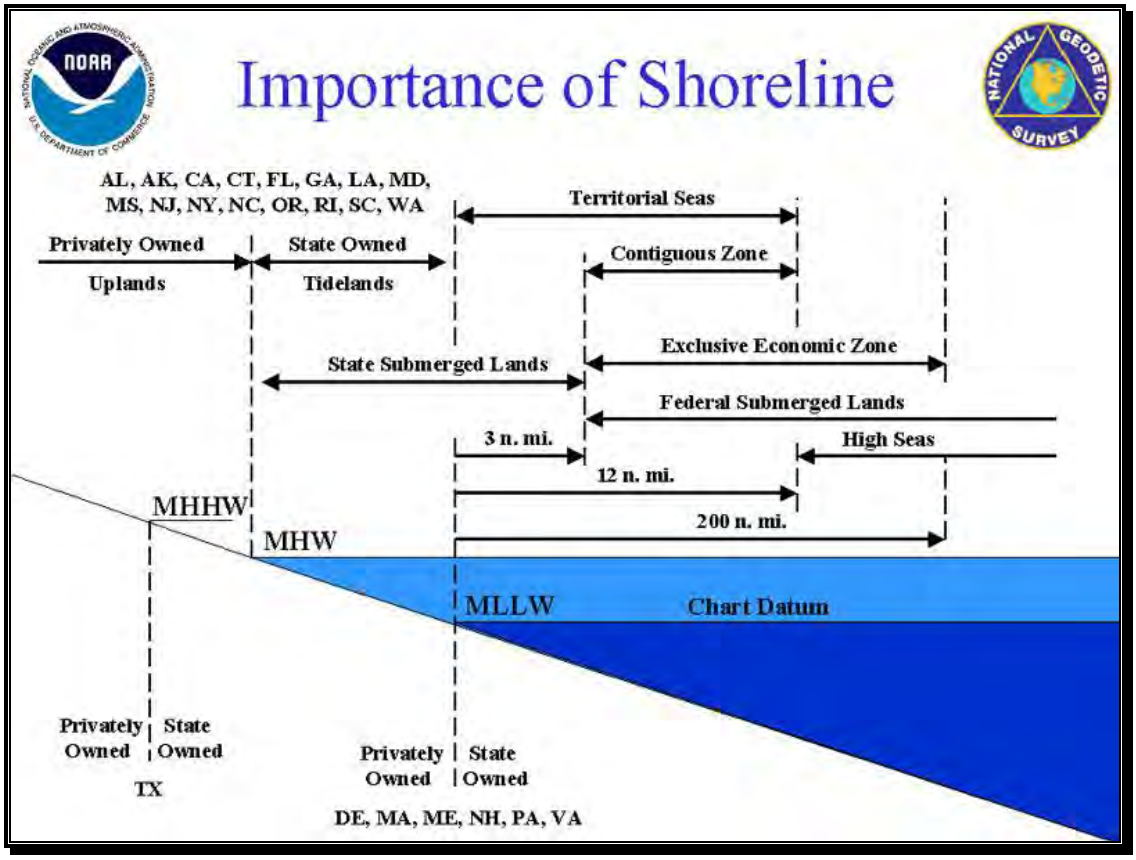


Figure: shoreline boundaries for various states, courtesy of NOAA, Department of Commerce.

Introduction to Tidelands

As demonstrated by the figure, there is an absence of uniformity in state laws for the boundary between uplands and aquatic lands for those states influenced by the tides. One state uses mean higher high water, six states use mean lower low water, and sixteen states follow the federal rule by using mean high water.

The Upland Boundary

In general, tidelands are located at the shore of all saltwater areas and including portions of rivers that are tidally influenced. Except in those cases where the meander line is used as a boundary, the waterside boundary is the line of ordinary high water in those bodies subject to a tidal flow, which is further defined as being ordinary high tide and means the same as mean high tide. In Puget Sound, the mean high tide line varies from 10 to 13 feet above the datum plane of mean lower low water (elevation 0.0). Mean high tide can apply to rivers for a considerable distance inland, for example, the Columbia River is considered tidal some distance upstream from Portland, OR.

Tideland Classes

Tidelands are also classified as either first or second-class lands depending on whether they are within two miles of an incorporated city. To determine if the tidelands are within two miles of the corporate limits of a city, the distance is measured along the shoreline from the intersection of the corporate limit with the shoreline.

"First class tidelands" means the shores of navigable tidal waters belonging to the state lying within or in front of the corporate limits of any city, or within *one mile* thereof upon either side and between the line of ordinary high tide and the inner harbor line. Also, for first class tidelands within *two miles* of the corporate limits, the landward boundary is the line of ordinary high tide and the waterward boundary may be either the line of extreme low tide, the inner harbor line, where established, or the bounds as shown on the plat. [See RCW 79.105.060(4)]

"Second class tidelands" means the shores of navigable tidal waters belonging to the state, lying outside of and more than two miles from the corporate limits of any city and between the line of ordinary high tide and the line of extreme low tide. Many tidelands that were originally sold as second-class lands may now be within two miles of a recently incorporated city. Those tidelands sold as second class tidelands will continue to be second class tidelands, they do not convert to first class tidelands, and the classification of these lands depends upon the classification at the time of sell. [See RCW 79.105.060(18)]

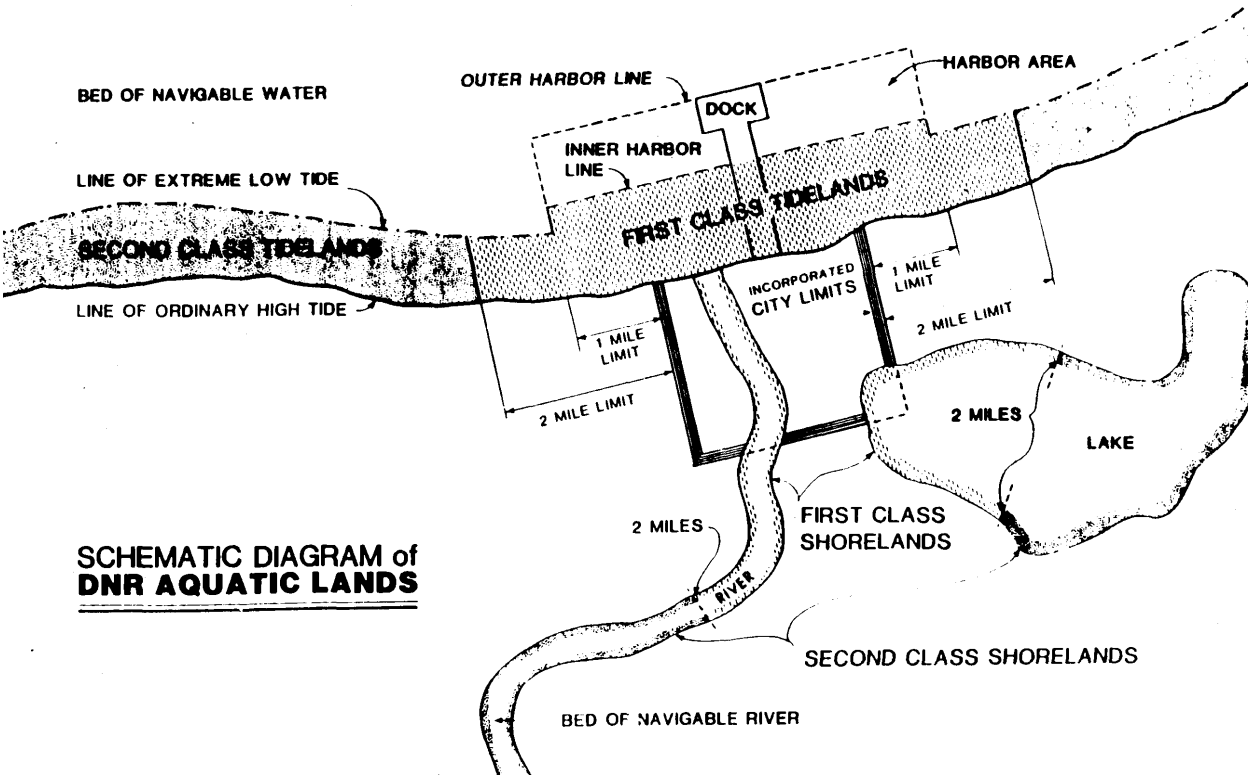


Figure: Second class aquatic lands are more than two miles from the corporate city limit.

The Outer Boundary of Tidelands

In those areas where harbor lines have been established, the outer boundary of first class tidelands is the inner harbor line, regardless of the actual location of a tidal datum line. In nearly all cases where harbor lines are established, the tidelands have been platted and boundary location principles are essentially the same as for plats on the uplands.

Typically, the original GLO meander lines were used in the descriptions of second class aquatic land parcels because the lands were not surveyed and platted. Generally second class tidelands were originally sold by linear frontage, they were described as "lying in front of and abutting" a specific upland tract, and the description would specify a distance measured along the original GLO meander line. Most times these deeds did not describe the waterward limit of ownership for the property; each tideland sale was dependent upon the statue in effect at the time of sale.

From 1890 to 1895 second class tidelands were surveyed by the purchaser and sold according to a metes and bounds description, which approximated the line of mean low tide based upon the survey, and whereby their boundaries were fixed by a definite described line. During this short period, the tideland classes were divided further to provide for 3rd class tidelands. Both 2nd class and 3rd class tidelands were greater than 2 miles from an incorporated city or town, but 2nd class tidelands also had “valuable improvements” on the tidelands and 3rd class tidelands would embrace all other tidelands.

In 1895, the statutory definition of second-class tidelands was amended and the requirement for the submittal of a survey was eliminated. From 1895 to 1911, the limit of second class tidelands was defined to extend to the line of “mean low tide”. All second class tidelands (and shorelands) were sold at no less than $5.00 per lineal chain measured along the meander line and the applicant was to furnish a copy of the US field notes of the meander line with their application. When interpreting these descriptions, examine closely the intend within the description; was the sale for tidelands fronting a specific uplands parcel regardless of the lineal length measured along the meander line or was the intent to sale tidelands based solely on the lineal measurement along the meander line.

On March 8, 1911 the statutory definition of second-class tidelands was amended and the water ward limit of tidelands was defined to extend to the line of “extreme low tide”. After the definition of tidelands was changed, prior purchasers of second-class tidelands were granted a ninety-day preference right to purchase the additional tidelands abutting their property out to extreme low tide. Not all second-class tideland owners elected to purchase the additional tidelands so the outer limits of private tidelands may alternate between mean low and extreme low tide. For title purposes, you must be aware of the historical difference in tideland definitions and which applies to the subject tidelands parcel.

The controlling date for the outer tideland boundary is the date of sale or the date on the signed contract and not the date on the deed. In many cases, a purchaser may have a ten-year contract to purchase tidelands according to the statute in effect at the time of application. Once the final payment was received

and the terms of the contract were completed, then a deed would be issued, which is several years after the initial application. Copies of the transcriptions from the original tideland deeds are on microfilm cards and the contracts of sale are in the original application to purchase files; all are available from the Washington Department of Natural Resources.

The official abstract of aquatic land sales are found on the aquatic index sheets on file in the Title and Record Office. Each of the notations reference a file and/or deed for each transaction.

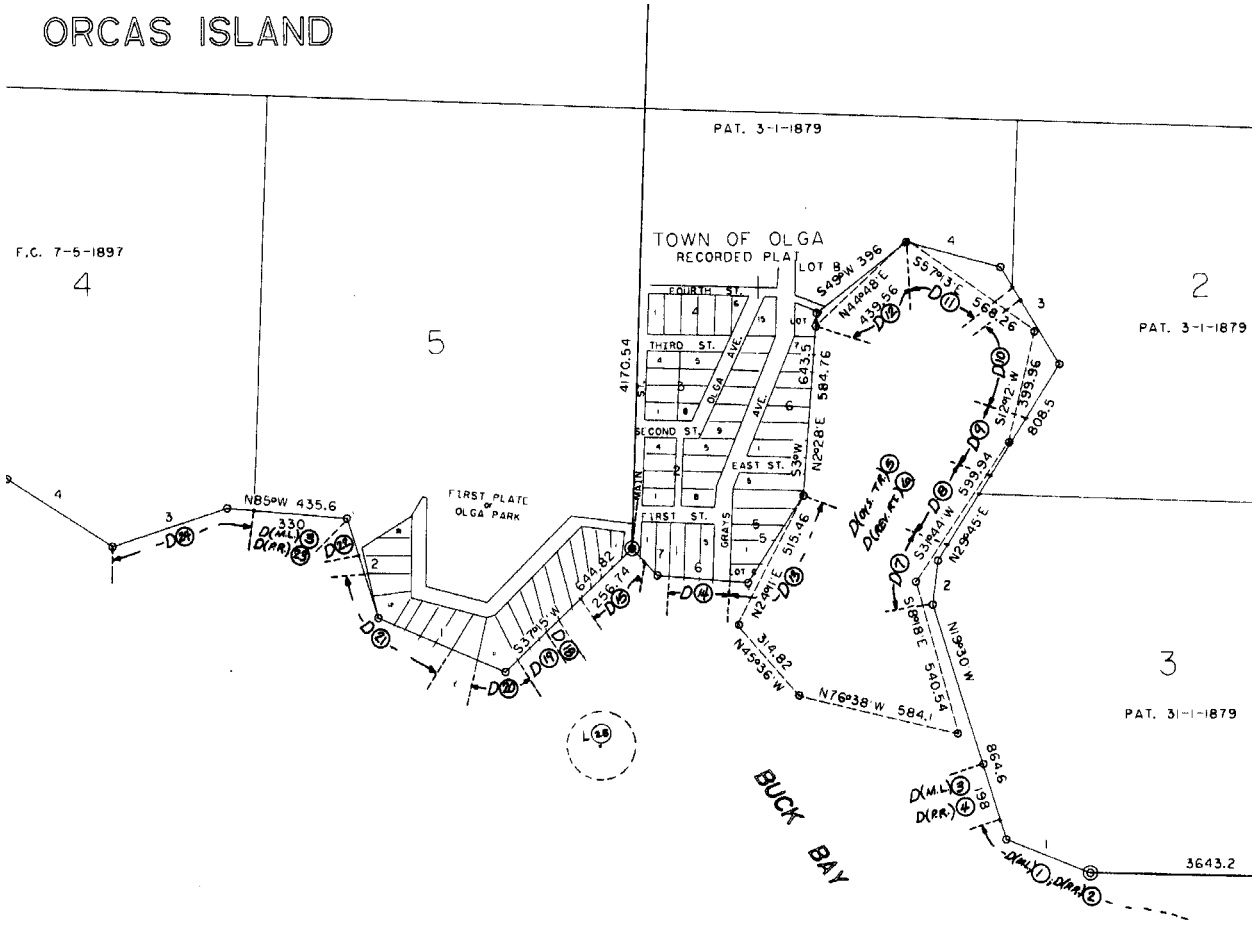


Figure: Index sheet for second class tidelands and an oyster tract.

ACTIVITY REGISTER

SEC. 8 & 9 ; TWP. 36 N.; RGE. 1W ;W.M.

NOTE	APP. NO.	NAME	DATE OF ISSUE	DOCUMENT & TERM	LAND TYPE	LOCATION
1	A.P. 3221	T. MORROW	8-23-1910	D.V. 9 P. 512	2.T.(M.L.)	LOT 5 SEC. 9
2	A.P. 6471	W. CLINE	6-6-1911	D.V. 11 P. #13	2.T.(P.R.)	LOT 3 SEC. 9
3	A.P. 3220	C. CUNNINGHAM		D.V. 8 P. 198	2.T.(M.L.)	LOT 3 & 5 SEC. 9
4	A.P. 6661	S. WHIPPLE	6-6-1911	D.V. 11 P. 128	2.T.(P.R.)	LOT 3 SEC. 9
5	A.P. 3742	F. WOMER & G. GERHARD	1-28-1904	D.V. 5 P. 34	OYS. TR.	LOT 1, 2 & 3 SEC. 9
6	A.P. 11945	E. EVERETT ET. AL.	1-2-1951	D.V. 21 P. 438	REV. RT.	LOT 1, 2 & 3 SEC. 9
7	A.P. 11940	J. GOLITHON	7-3-1950	D.V. 21 P. 355	2.T.	LOT 3 SEC. 9
8	A.P. 11978	C. SIMPSON	7-3-1950	D.V. 21 P. 365	2.T.	LOT 2 & 3 SEC. 9
9	A.P. 12050	C. SIMPSON	6-26-1951	D.V. 21 P. 489	2.T.	LOT 2 SEC. 9
10	A.P. 11988	M. CHRISTIANSON	7-3-1950	D.V. 21 P. 375	2.T.	LOT 2 SEC. 9
11	A.P. 11968	E. EVERETT	10-30-1950	D.V. 21 P. 423	2.T.	LOT 1 SEC. 9
12	A.P. 11965	L. & L. BANNETT	4-9-1959	D.V. 22 P. 839	2.T.	LOT 1 SEC. 9

Figure: Activity Register on an Aquatic Index Sheet

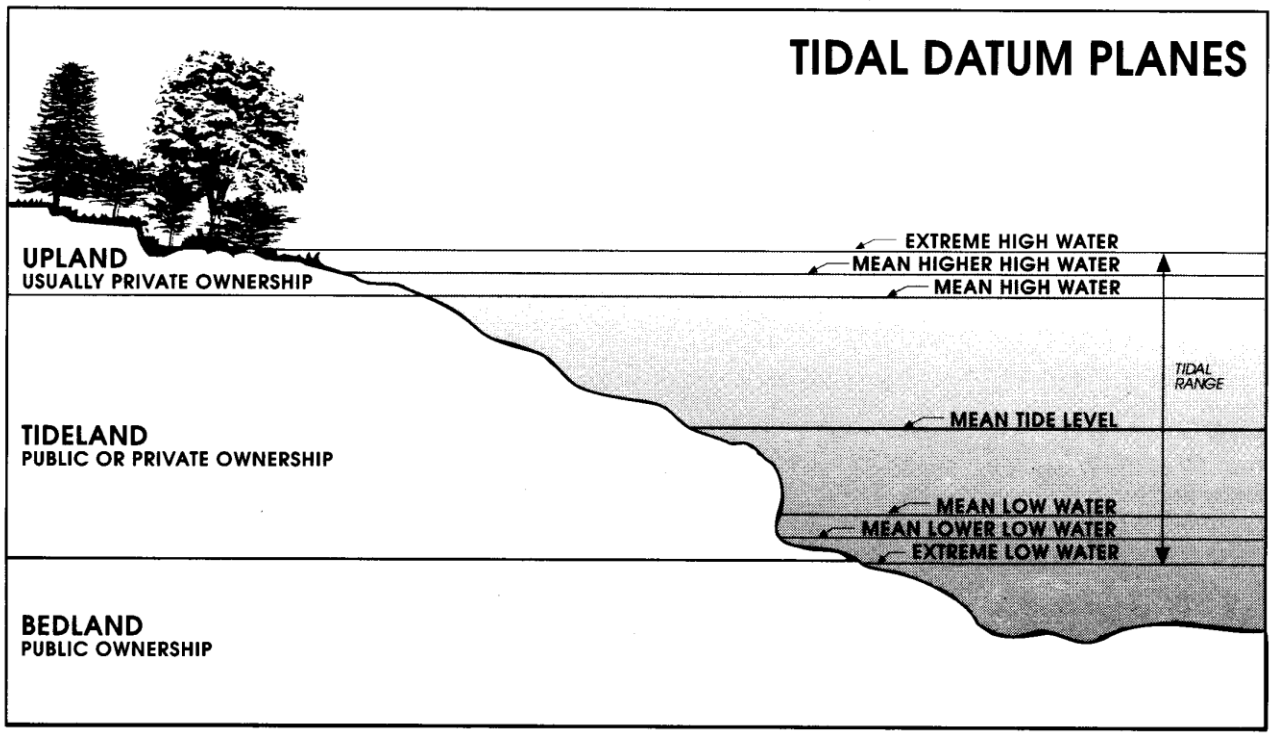


Figure: Tidal datum planes for aquatic land ownership.

Chapter 8: Lateral (Sideline) Boundaries for Aquatic Lands

Introduction

Most of the second class tidelands and shorelands were conveyed by the State of Washington by identifying the subject lands as lying in front of or abutting an upland parcel followed by a distance, in chains, which was measured along the original GLO meander line. A common belief and mistake by upland owners is assuming that their sideline boundaries are direct extensions of their upland boundaries. This assumption can cause many problems if structures are placed using this erroneous assumption.

The waterward boundaries of aquatic lands are generally defined by statute, but the state did not describe either the sideline boundaries or the waterward boundary in its deeds for aquatic lands. These descriptions generally begin with words, such as, "tidelands of the second class in front of and abutting . . ." and go on to describe an upland parcel or describe a linear measurement along the meander line. In contrast, the definition of sideline boundaries relies exclusively on common law principles.

Lateral/Sideline boundaries by Apportionment

Washington courts, in establishing the lateral boundaries of second-class tidelands and shorelands and apportioning such lands among owners of adjacent upland tracts, have basically followed what is commonly known as the Massachusetts Rule from the 1944 case of *Spath v. Larsen* and from the case of *State v. Corvallis Sand & Gravel Co*. If the parties are unable to agree as to the location of the boundary line between their respective tidelands or shorelands that line may be determined only by a survey made in accordance with the rules as governed by the following guidelines and principles:

- Aquatic tracts described by metes and bounds or as platted lots do not require apportionment as their boundaries are specifically defined by the plat or description. The actual ownership boundary of these tracts may differ from the described boundary by the inclusion of limiting language, such as the exclusion of bedlands or uplands or a senior aquatic land sale.

- The extension of upland boundaries across tide/shore lands is almost never utilized and should be disregarded. Each upland owner is entitled to an equitable share in the adjoining tidelands or shorelands in regard to their length of the shoreline.

- The sidelines for tidelands or shorelands may be divided between adjoining owners by erecting lines perpendicular to the general course of the shoreline only in cases where the shoreline is substantially straight.

- Each upland owner is entitled to a proportionate share of the tidelands or shorelands, therefore the direction of the division lines within a cove will converge. The general rule for apportioning is each owner is entitled to a length of shoreline at the low water line that is in proportion to the length of his or her shoreline at the high water line. In the case of tidelands, the apportioning will normally use either the line of mean low tide or the line of extreme low tide or may use both. In the case of shorelands, the apportioning will normally use the line of navigability.

- In the case of tidelands or shorelands which are situated on a headland, the same apportioning principles would apply, but then the sidelines, which divide the tidelands or shorelands, would diverge from the shoreline to the outer edge of the tidelands or shorelands.

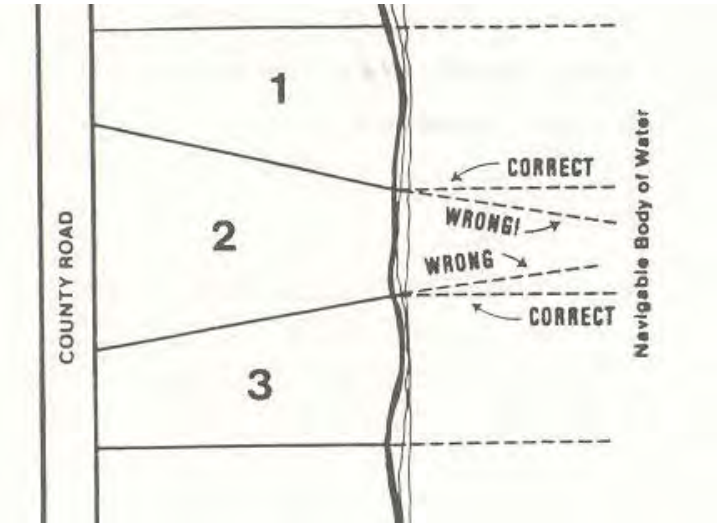


Figure: sidelines with a straight shoreline.

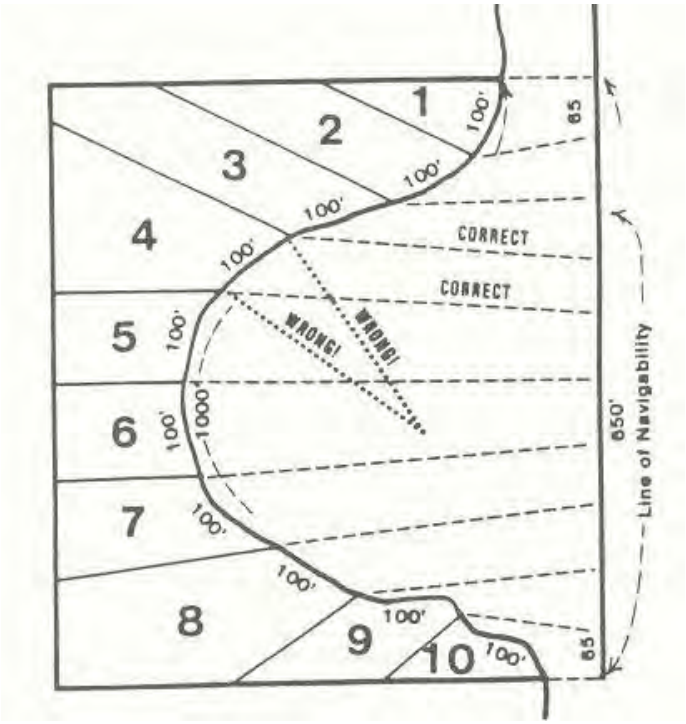


Figure: Sidelines within a Cove

The following example is apportionment of tidelands at the mouth of the Hamma Hamma River. The dispute over ownership to tidelands included aspects resulting from a cove, the division of a large tide flats generated by a river delta, and a mixture of ownerships based upon metes and bounds descriptions and second class tidelands ownership to extreme low tide. This apportionment survey was necessary to resolve uncertain boundaries in the 1945 case of *Hamma Hamma Logging v. Allie Ahl* in Mason County Superior Court, Cause No. 4467. The solution utilized apportionment of tideland ownerships based upon the line between the headlands of the cove and apportionment along the line of extreme low tide.

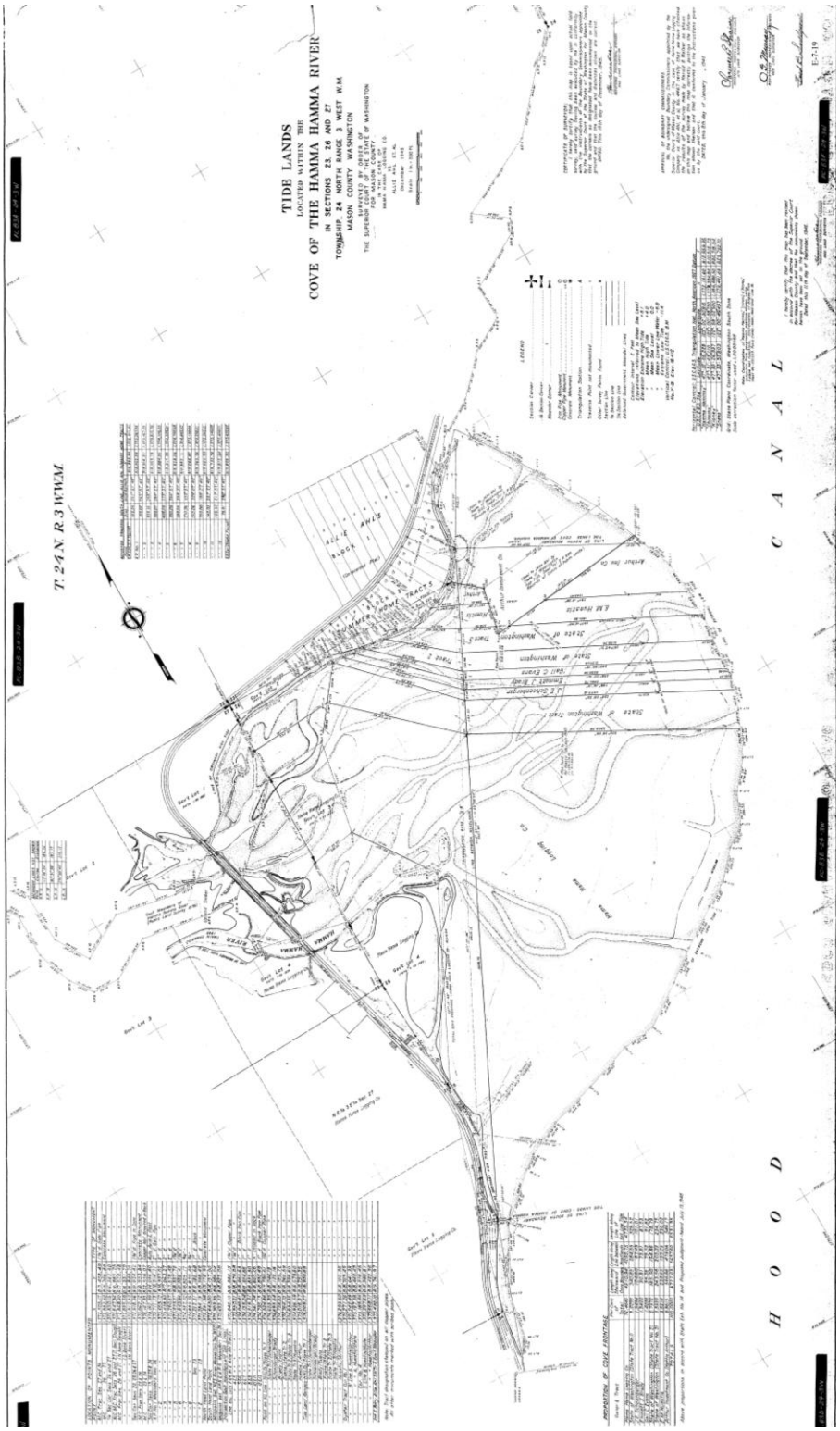


Figure: Example of tidelands apportionment.

Chapter 9: Oyster Lands

The early development of Washington State recognized the significant value for those lands suitable for oyster production and in 1895; two acts were adopted to allow for the sale of “oyster lands”. Those tidelands sold as "oyster lands" were surveyed tracts that were described by a metes and bounds description that followed the direction of the oyster beds rather than a tidal elevation. There are distinct rules governing the sale and use of land under each Act. Adding to the confusion, since the passage of the original Acts in 1895, there have been a series of related bills passed that have created a web of exceptions and provisos to the original Acts’ language and deed restrictions. For any given property, it may take a significant amount of research to determine exactly what uses are allowable under its deed restrictions.

The “Bush Act”, Chapter 24, was adopted March 2, 1895; the act permitted the sale of aquatic lands for the purpose of oyster planting, and to encourage and facilitate the industry. Also, the act was specific to naturally occurring oyster beds and an applicant could purchase no more than 100 acres. The original act limited the activity to the purpose of oyster planting, but the land could lie fallow just as any agricultural operation. The deeds issued for Bush Act lands included a deed restriction whereby the Commissioner of Public Lands could cancel the sale and the lands would revert back (reversionary right) to state ownership if the lands are used for purposes other than oyster cultivation.

The “Callow Act”, Chapter 25, was adopted March 3, 1895; the act was similar to the Bush Act, but the sale of land was limited to those persons who, previous to March 26, 1890, had entered upon the tidelands and planted and cultivated artificial oyster beds. The applicant could purchase no more than 40 acres and the lands could not lay fallow. The deeds also include a deed restriction, whereby, the land would automatically revert to state ownership if the lands cease to be used for oyster production.

Many subsequent laws have clouded the ownership of oyster lands and the appropriate uses on these lands. In 1915, Callow Act landowners could “convert” their Callow Act lands to Bush Act lands as it relates to allowed uses. In 1919, the “Edible Clam Law” allows the use of Bush and Callow lands for the cultivation and propagation of clams and other edible shellfish. In 1925 & 1927, Bush and Callow landowners could purchase their full reversionary rights from the State, but not all landowners exercised this option. In 1935, the Bush and Callow Acts were repealed and in 1949, the Edible Clam Law was repealed.

Most recently, in 2001 the use of Bush and Callow Act lands was “grand fathered” (see RCW 79.135.110) by allowing the continued cultivation of oysters, clams, and other deep-water shellfish within the inter-tidal portion and the sub-tidal portion of their property so long as the active cultivation of the deep-water shellfish (in particular geoduck) was initiated prior to December 31, 2001. The 2001 act (see RCW 79.135.200) also requires a sub-tidal survey to be filed with the DNR and the survey must identify the sub-tidal boundaries of the property, which must be marked prior to the harvesting of geoduck.

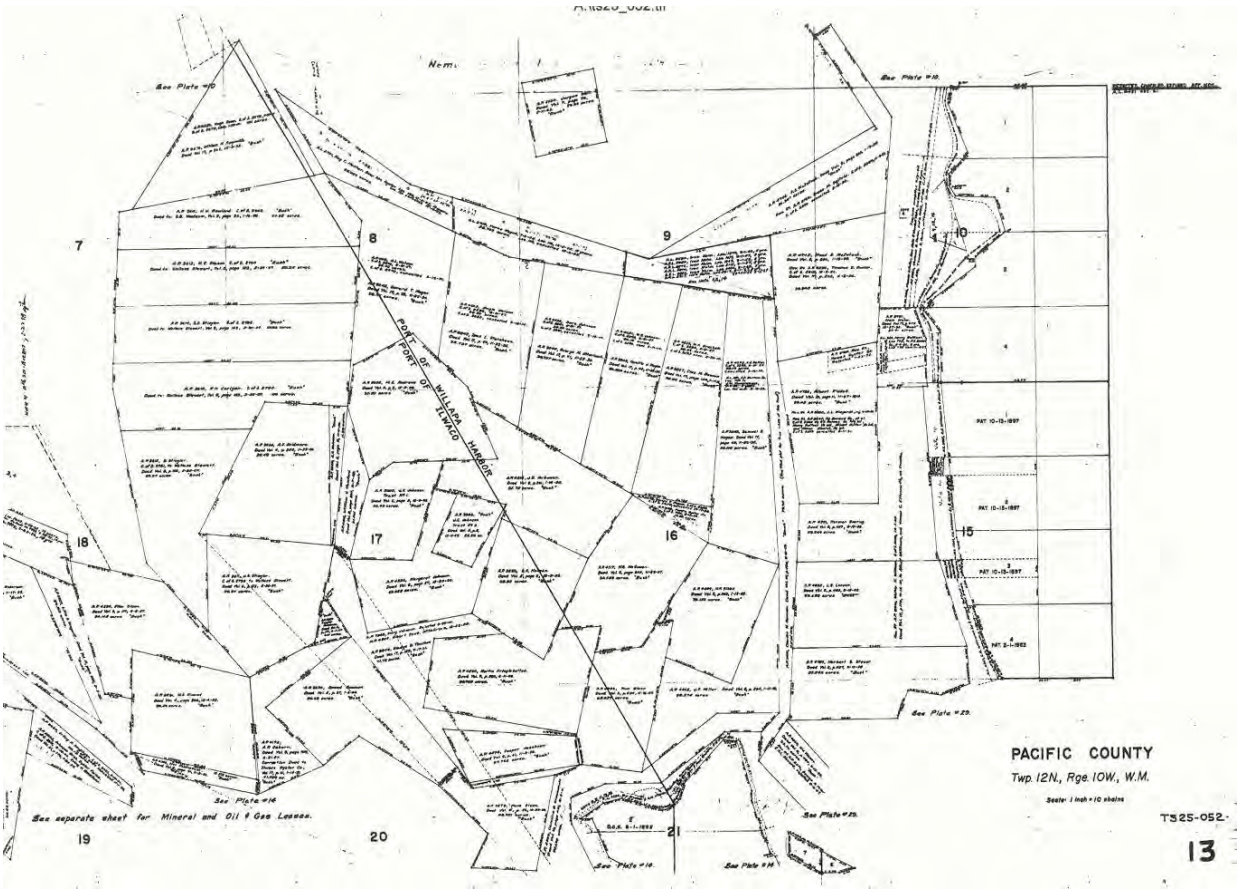


Figure: Example of index sheet for oyster land sale in Willapa Bay.

There are nearly 47,000 acres of Bush and Callow lands in the State of Washington with 98.8 percent of the lands being Bush Act lands. The majority of these lands are located in Pacific County (Willapa Bay) and in Grays Harbor County (Grays Harbor), but oyster lands can be found scattered through the counties abutting Puget Sound and the Straits of Juan de Fuca.

Chapter 10: Harbor Areas, Waterways, and Streets

Introduction

Washington State's harbor line system is unique by designating aquatic lands in front of and near the waterfronts of incorporated cities for harbor areas and the ownership of the harbor areas was retained by the state. In other states, harbor lines are simply management tools used to control the placing of structures and fill in the navigable waters. In Washington, the harbor lines serve as boundaries between private lands and state lands, as well as serving the function of controlling uses within the navigable waters. The Washington system of harbor lines is a unique means of protecting the public interest by insuring public ownership and control of state owned aquatic lands in front of and near the commercially important waterfronts of cities.

Constitutional Creation of Harbor Areas

Article 15, Section 1, of the Washington State's constitution requires the establishment of harbor areas in front of cities and the harbor areas are forever reserved for landings, wharves, streets, and other conveniences of navigation and commerce. The Article directed the legislature to create a commission whose duty would be to locate harbor lines in all harbors, estuaries, bays, and inlets where such waters lie within or in front of or within one mile on either side of any incorporated city.

The state is also prohibited from relinquishing any control over these areas. The Commission locates harbor lines by identifying both an "inner" and an "outer harbor line". The designated area between the inner and outer harbor lines is the harbor area. The outer harbor line is drawn over water, which is deep enough to accommodate the largest ships using the body of water. This line represents the maximum distance waterward to have structures extend without interfering with navigation. Typically the outer harbor line was established in water with a depth between 30 to 45 feet referenced to lower low water. The inner harbor line would be offset from the outer harbor line with a minimum width of 50 feet and a maximum width of 2000 feet (after 1932 amendment). Following the creation of the harbor area, the intervening tidelands were surveyed, plated, and appraised for sale.

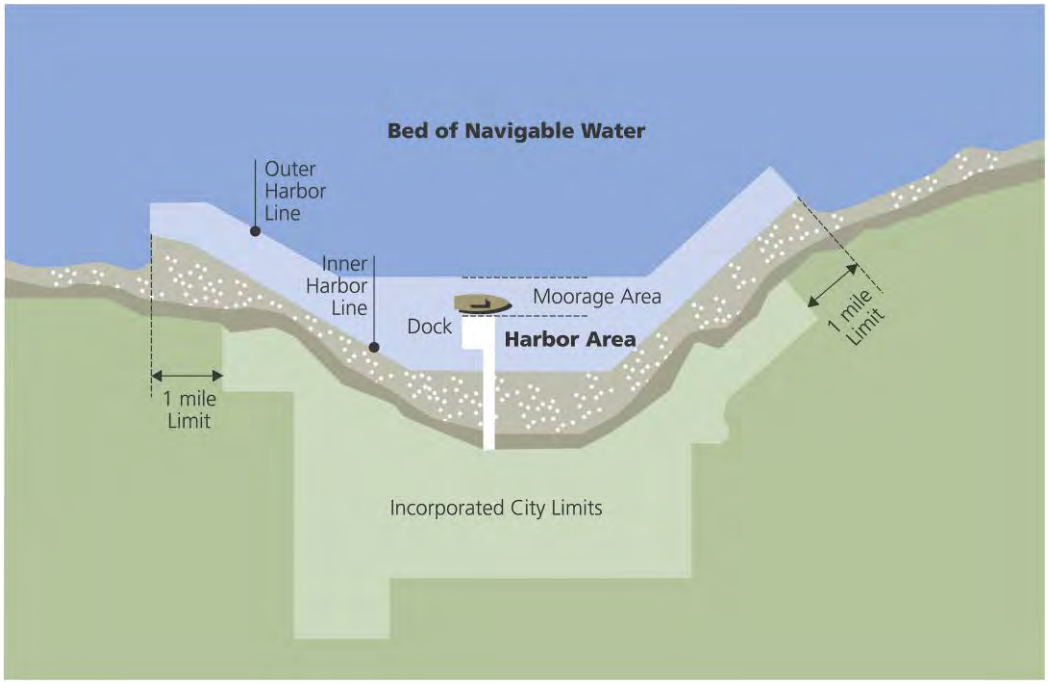


Figure: Harbor Area to extend one-mile beyond the city limits.

Waterways, Streets, and Public Places

To facilitate the public access to the harbor area, statutory authorities create 3 methods of access:

1. Streets of towns and cities are allowed to cross over tidelands and across harbor areas to the outer harbor line.

2. Waterways were created to provide access between uplands and open water. They were established to provide unobstructed public highways.

3. Public places were set aside for use as public landings, wharves, and other conveniences of commerce and navigation.

A state waterway is an area platted across state-owned aquatic lands under RCW 79.120.010. State waterways are not less than fifty or more than one thousand feet wide, beginning at the outer harbor line and extending inland across the tidelands or shorelands belonging to the state. In conjunction with the platting of harbor areas, waterways were created to provide a connection between navigable rivers and streams and the navigable waters beyond the harbor area. Within waterways permanent structures are not allowed because the waterway is specifically for navigation purposes from adjoining tideland parcels to the harbor areas. In addition, other waterways exist that were established under other statutory authorities for counties (RCW 91.08), cities (RCW 35.56.210 to .260), port districts (RCW 53.08.060), and commercial waterway districts (the Act of February 9, 1911 in Session Laws 1911, Ch. 11) that are not owned by the State of Washington.

Article 15, Section 3 of the Constitution also grants to municipal corporations the right to extend their streets over intervening tidelands and across the harbor area. A street across the intervening tidelands is used like any other city street and it can be vacated by the city, whereby the abutting lot owners acquire title to one-half of the vacated a street by operation of law. That portion of a street extended through the harbor area is reserved for docks wharves and piers and can also be vacated, but the underlying ownership remains with the state to preserve the integrity of the harbor area.

First Class Tidelands

Following the plat of the harbor lines, and waterways, the Board of Tideland Appraisers commissioned a survey of the aquatic lands lying between the inner harbor line and the line of mean high tide or lying between the inner harbor line and the meander line. Following the tidelands plat, the first class tidelands could be appraised and were available for sale.

To determine the boundary of the first class tidelands requires an examination of the plat that is on file at the office of the Commissioner of Public Lands. Sometimes the survey and plat for first class tideland was very good and the location of the lots, blocks, and tracts were easily located, but other plats were poorly executed resulting in many ownership problems that remain today.

Figure: Harbor Lines and Harbor Area at Ilwaco, WA.

Note of Caution

A point of confusion in harbor areas is the Federal pierhead lines and bulkhead lines. The pierhead line is the line waterward of which no construction can take place without a federal permit and landward of which no federal money can be spent to dredge. (33 USC, sections 404) The WA state inner harbor line was frequently placed coincident with the U.S. Army Corps of Engineers bulkhead line, which marks the waterward extent which fill may be placed. On many Army Corp of Engineers maps, pierhead lines and bulkhead lines are also referred to as harbor lines, so a note of caution is necessary to avoid misinterpretation and use of the lines for two distinct and different purposes.

Chapter 11: Shorelands

Introduction to Shorelands

In general, shorelands are located at the shore of all freshwater areas and do not include portions of rivers that are tidally influenced. Except in those cases where the meander line is used as a boundary, the waterside boundary is the line of ordinary high water, which is defined as the line of permanent upland vegetation along the shores of non-tidal navigable waters. In the absence of vegetation, it is the line of mean high water.

In 1912, in the case of *Austin v. Bellingham,* the Washington Supreme Court ruled that the high water mark separates land, which properly belongs to the riverbed from land that belongs to the adjoining upland owner. The Austin case also held that land that was covered by annual floods, but at other times useable for grazing or pasturing was upland and not aquatic land, and "soil which is submerged so long or so frequently, in ordinary seasons that vegetation will not grow on it may be regarded as part of the bed of the river." Federal courts have held that the "line of ordinary high water" is the line below which vegetation is destroyed or below which the soil is worthless for agriculture.

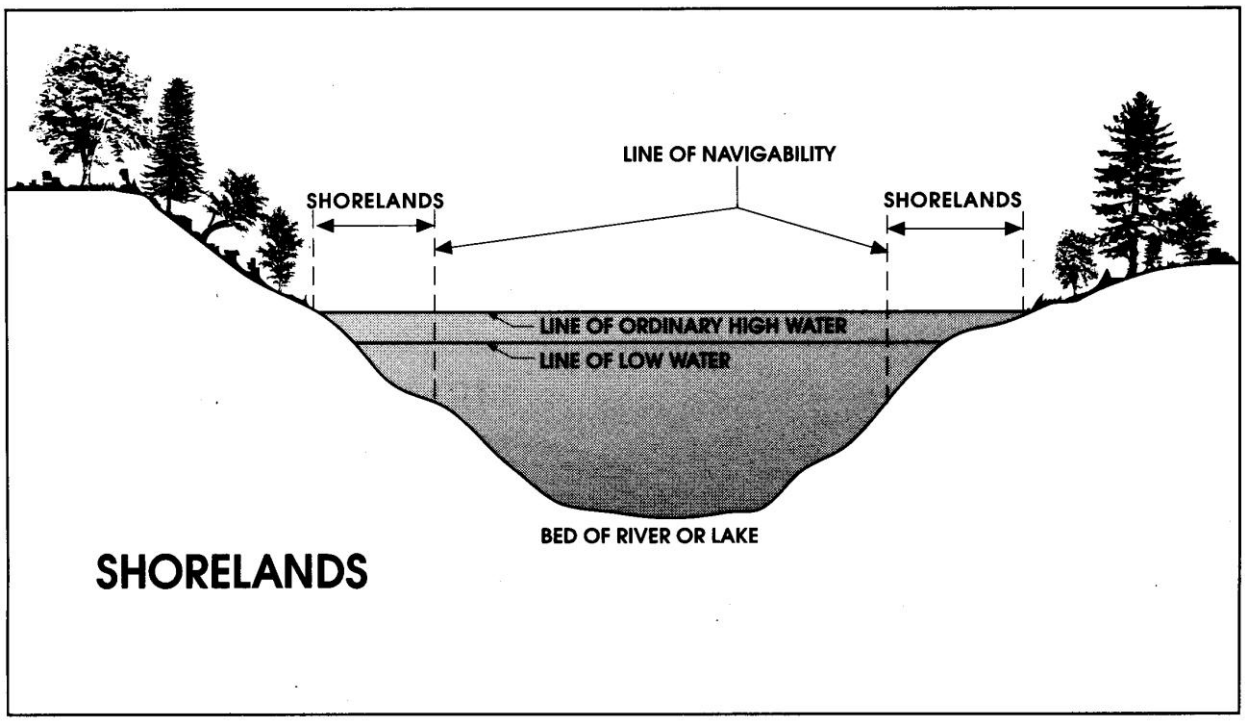


Figure: Shoreland limits in Washington.

Shoreland Classes

Shorelands are also classified as either first or second-class lands depending on whether they are within two miles of an incorporated city. To determine if the shorelands are within two miles of the corporate limits of a city, the distance is measured along the shoreline from the intersection of the corporate limit with the shoreline.

"First class shorelands" means the shores of a navigable lake or river belonging to the state not subject to tidal flow, lying between the line of ordinary high water and the line of navigability, or the inner harbor line where established and within or in front of the corporate limits of any city, or within two miles thereof upon either side. [See RCE 79.105.060(3)]

"Second class shorelands" means the shores of a navigable lake or river belonging to the state, not subject to tidal flow, lying between the line of ordinary high water and the line of navigability, and more than two miles from the corporate limits of any city. [See RCW 79.105.060(17)]

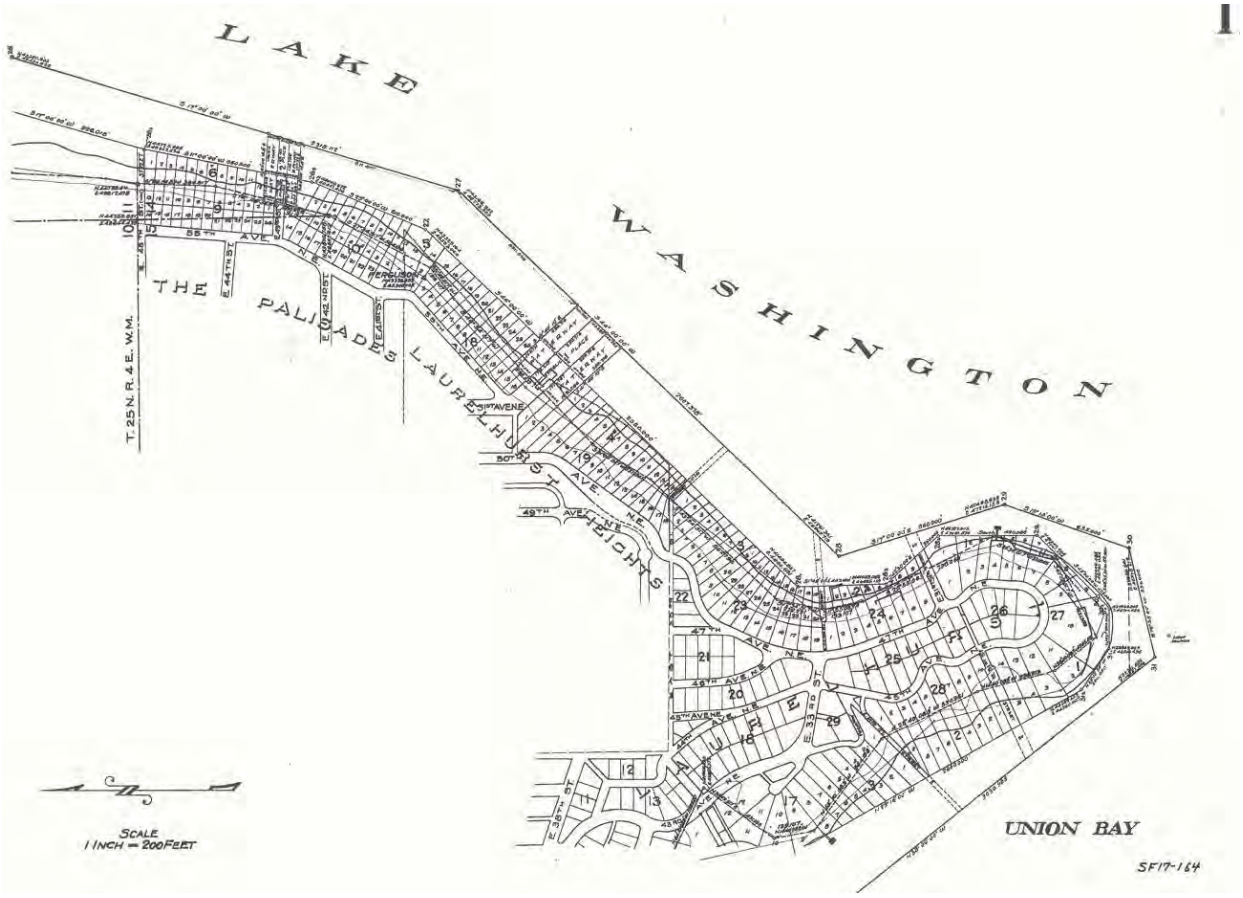


Figure: Example of Lake Washington First Class Shorelands

The Outer Boundary of Shorelands

In those areas where harbor lines have been established, the outer boundary of first class shorelands (just as in first class tidelands) is the inner harbor line, regardless of the depth of water. In nearly all cases where harbor lines are established, the shorelands have been platted and boundary location principles are essentially the same as for plats on the uplands.

For second-class shorelands, meander lines typically are used in the descriptions because the lands were not surveyed and platted. Generally second class shorelands were originally sold by linear frontage, they were described as "lying in front of and abutting" a specific upland tract, and the description would specify a distance measured along the original GLO meander line. Since these deeds did not describe the

water ward limit of ownership for the property, each shoreland sale is dependent upon the future establishment of a “line of navigability”.

For many years, shorelands were routinely sold by the state, but in 1971, the Legislature prohibited the sale of first class shorelands except to other public entities, and then only if the land will be used solely for municipal or state purposes. In 1982, the legislature authorized the sale of second-class shorelands on lakes to private owners of abutting uplands if the sale is not contrary to the public interest, as determined by the Board of Natural Resources, however, the Department rarely sells second-class shorelands.

The Outer Boundary of Shorelands

The line of navigability is the boundary that separates bedland from shorelands on navigable lakes and rivers. This is not based on a low water point, as with tidelands. Instead, it is based on where watercraft typical for that waterbody can be, and historically have been, safely operated. Although the Department can designate this line, a court can also determine the line.

Shorelands exist in freshwater areas that are not tidally influenced between the line of ordinary high water and the "line of navigability. The "line of navigability" is not defined by statute, but the Department of Natural Resources has chosen to define it as "a measured line at that depth sufficient for ordinary navigation as determined by the Board of Natural Resources for the body of water in question." WAC 332-30-106 (33). The Department of Natural Resources is charged with establishing the line of navigability, but in fact has done so in only a few cases.

Washington courts have discussed the concept for the line of navigability, but always in the context of Lake Washington. Nevertheless, several principles established in these cases probably apply to any dispute over the location of the line of navigability on shorelands. State sales of shorelands, that do not describe the waterward boundary, carry an implied reservation to later establish the waterward limit of this ownership interest.

Early legislation recognized that the outer boundary of second class shorelands sales were not well defined, but in Chapter 183, Laws of 1913, the legislature required the Commissioner of Public Lands to survey and plat the previously sold second-class shore lands in Lake Washington. This legislation defined the outer boundary of second-class shore lands to be “the line of ordinary navigation”.

The survey and platting of Lake Washington was contested in 1916 in the WA Supreme Court case of *Puget Mill Co. v. State*. The Court affirmed that the outer boundary of second-class shore lands would be the “line of ordinary navigation”, which currently is referred to as the “line of navigability” and also equates to the inner harbor line, where existing. The Court further ruled that the conveyance of second-class shore lands by a state deed is subject to the power of the State to thereafter establish a harbor line or line of navigability under the provisions of Article 15 of the State Constitution.

The Proper Method to Locate the Placement of the Line of Navigability

As noted above, the controlling element for the placement of a line of navigability is "*a measured line at that depth sufficient for ordinary navigation".* This definition requires an in depth analysis to:

- Identify those types of commercial vessels used for ordinary navigation based upon current and historical uses.
- Determine the draft of the ordinary vessels used plus any additional depth of water required for a margin of safety.
- A hydrographic analysis to determine the ordinary flows (ordinary high and ordinary low) and extreme flows for each and every water body. The hydrographic analysis will have an increased difficulty due to the numerous alterations by mankind that have dammed, diverted, raised, and lowered the ordinary flows of rivers and the levels of lakes.

Past Practices

There have been three cases where a line of navigability has been established. All three cases are in Lake Washington and the sites were at Yarrow Bay in 1981, Meyenbauer Bay in 1960, and surrounding Mercer Island in 1984. At Yarrow Bay, the line of navigability varied from 6' to 12' of water depth and at Meyenbauer Bay, the line of navigability varied from 4' to 18'of water depth. In both cases, special consideration was made to provide an equitable solution with access for all affected property owners. At Mercer Island, the line of navigability was placed more on the basis of existing dock locations, therefore at times, the line is located in very deep water.

Current Practices

The RCW's and the WAC's do not provide any directions on how to establish a line of navigability. Also, WAC 332-30-144(9) declares "The department will not initiate establishment of lines of navigability on any shorelands unless requested to do so by the shoreland owners or their representatives." This WAC was adopted in response to Board of Natural Resources Resolution No. 447 dated March 6, 1984, which placed a moratorium on establishing lines of navigability because "there are no clear legal guidelines for establishing the line of navigability".

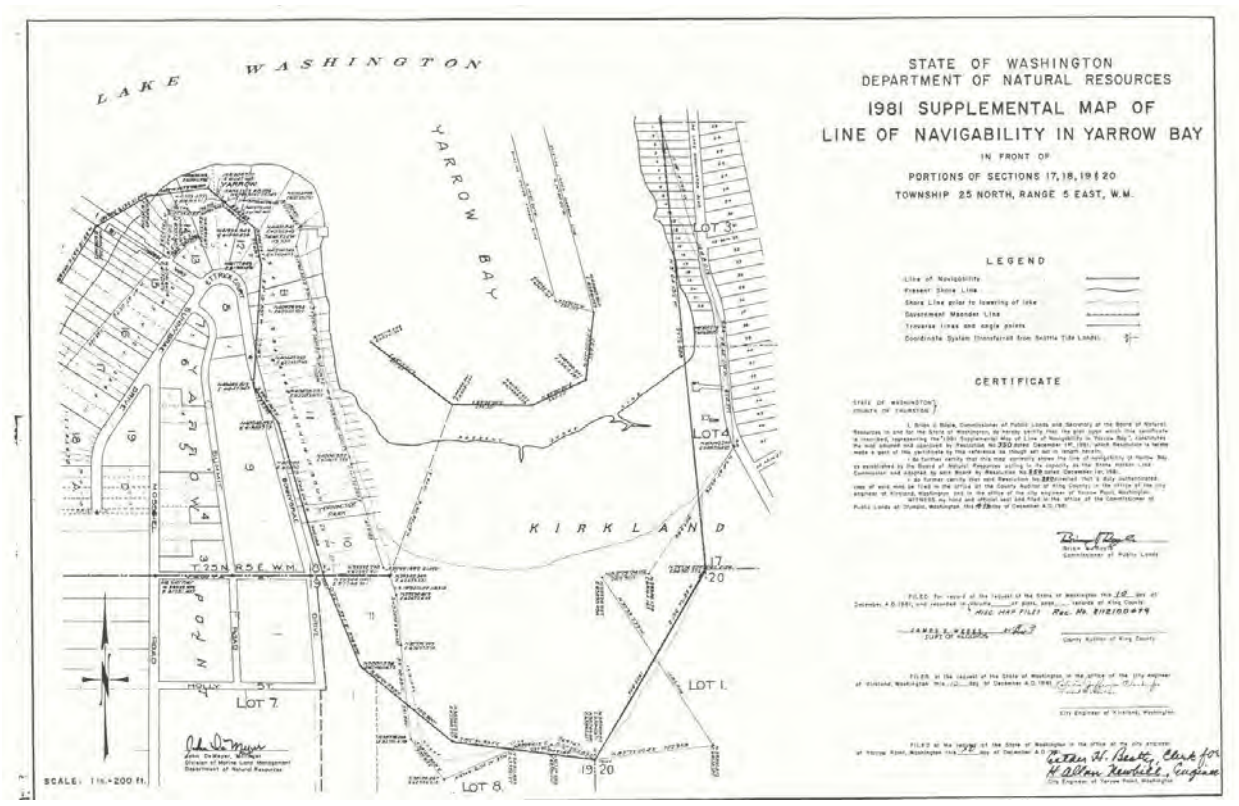


Figure: Example of Line of Navigability at Yarrow Bay on Lake Washington

Conclusion and Precautions:

Utilizing a uniform depth of water for the placement of a line of navigability would be inappropriate in some cases. Any alterations to the ordinary water level of a lake by dams or the diversion of water for irrigation would require alternative methods for any decisions made for the location of either line. The same special consideration would apply to those cases where the privately owned shorelands have been filled so to avoid unjustly rewarding the private shore landowner with additional shorelands, and the placement of the line of navigability would ignore the water depth fronting on these filled areas.

In the case of bays and coves, previous court opinions suggest that whatever formula might be used to ascertain the line of navigability, such as the depth of water, the final placement of the line of navigability must be applied in an equitable manner for all affected property owners. From this argument, you are not necessarily bound to a particular depth of water criteria for the placement of a line of navigability, but you may consider many factors and deviate from the norm.

In light of the previous court opinions, we can conclude that there is no specific depth of water, which can serve as a basis for drawing the line of navigability. Therefore, the location of the line of navigability will fluctuate in distance from the shoreline and fluctuate in depth of water. Any attempts to generalize the location for the *line of navigability*, may not receive favorable approval by the public or the courts.

Chapter 11: Shifting or Fixed Boundaries on Aquatic Lands

Introduction

Because the land/water interface is dynamic, attempts to precisely locate water boundaries become a complex and legal quagmire and unique laws and techniques have developed for defining and locating water boundaries. The result is the courts and land surveyors are called upon from time to time for precise and workable interpretations of these vague and ambiguous phrases.

Slow and Imperceptible Changes

The general legal principals concerning water boundaries and the ownership of lands with shifting boundaries were settled by common law in England before the United State gained independence. These general rules are still followed in the United States with some modifications to fit special circumstances.

The common law supplies a moving boundary rule in the case of slow and imperceptible changes by the natural processes of water-borne sedimentation. This rule states that when a watercourse serves as a boundary and the slow and imperceptible changes result in the gradual movement of the line of ordinary high water between the uplands and the submerged lands will result in a corresponding shift in the boundary.

The types of slow and imperceptible processes include erosion, reliction, and accretion.

Accretion

Accretion is the gradual extension of land by deposition of soil through natural causes and is formed by the washing up of sand, silt, or soil so as to form firm ground called alluvium. The 2009 Manual of Surveying Instructions defines accretion as . . .the grain-by-grain deposit of soil along the bank or bed of a stream or a lakeshore by the action of the water. The lands resulting from accretion are generally referred to as alluvium, but the courts recognize a unique distinction. *Alluvium* is soils which are deposited on the shore and above the water line, but batture is soils which are deposited on the bed and below the water line. The principles of law applied to the ownership of batture and to islands that emerge from the bed is an exception to the moving boundary principles.

The common law supplies a moving boundary rule and the legal effect is that the upland owner is constantly gaining property as their water boundary is exposed to the flowing waters and the new lands must be divided by the principles of apportioning. For legal purposes, the accretion will begin when the vegetation and other evidence for the line of ordinary high water move into the exposed areas. The typical seasonal drawdown or a drought of a short duration would not be considered as accretion.

In the case of *Nebraska v. Iowa*, 143 U.S. 359 (1892), the Supreme Court held:

> It is settled law, that when grants of land border on running water, and the banks are changed by the gradual process known as accretion, the riparian owner's boundary line still remains the stream, although, during the years, by this accretion, the actual area of his possessions may vary.

Within rivers, the hydraulics of flowing water setups the mechanism for accretions and erosion. The fastest water is along the outside of a river bend which erodes the soft material in the banks. When the water slows down, the suspended particles tend to drop to the bottom in the deep pools or near the inside of a river bend. In naturally flowing rivers, the velocity and the discharge volume are never constant, so the rates of erosion and accretion are changing all of the time and at different places along the bank.

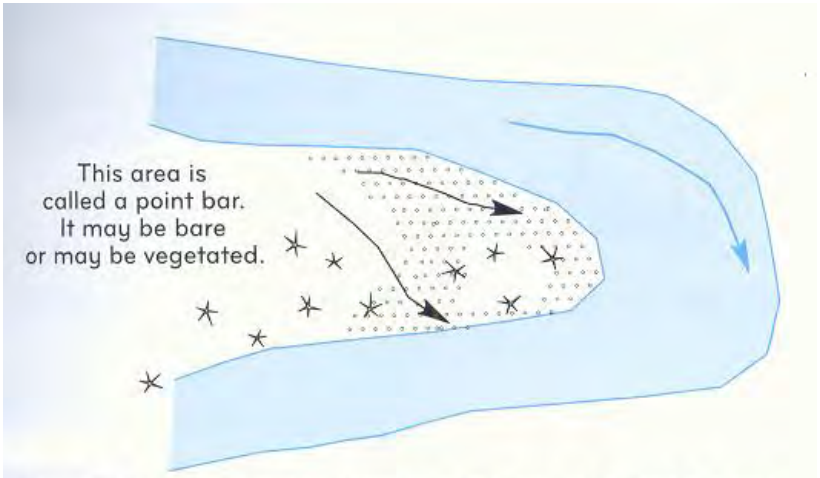


Figure 8-15. A point bar is an accretion on the inside of a bend in a river. Over time, a point bar can become vegetated and classifiable as upland.

Accretions form at a point bar on the inside of a bend in the river.

Courtesy of 2009 BLM Manual of Surveying Instructions

Erosion

Erosion is the opposite of accretion, where by the gradual eating or gnawing away of soil by the operation of water, so that the water encroaches upon an area that was dry land prior to the erosion. The common law supplies a moving boundary rule and the legal effect is that the upland owner is constantly losing property as their water boundary is exposed to the flowing waters.

Another definition of erosion is the slow and imperceptible washing away of land by the sea or a river's flow. The two key concepts in erosion are that the process usually occurs slowly and that ownership boundaries change, effecting a loss of land to the riparian owner. The 2009 Manual of Surveying Instructions defines erosion as "…the grain-by-grain removal of soil from the banks or bed of a stream or lake by the action of the water."

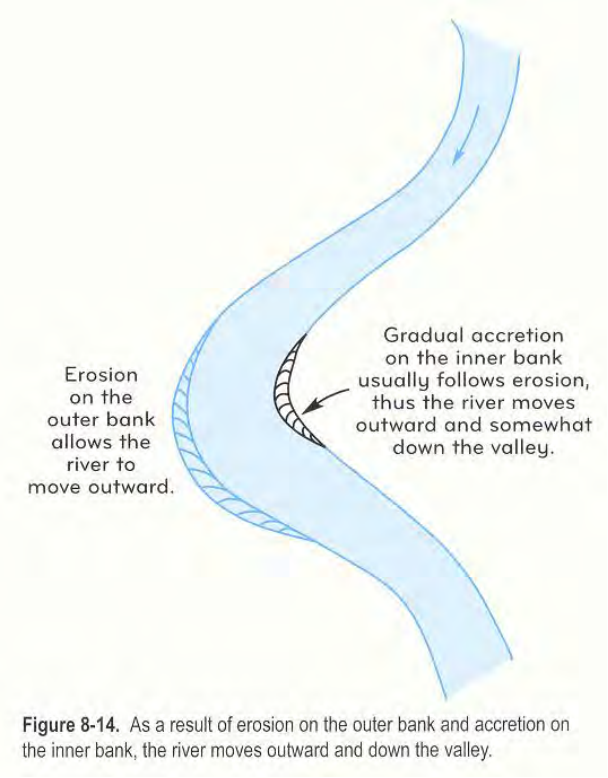
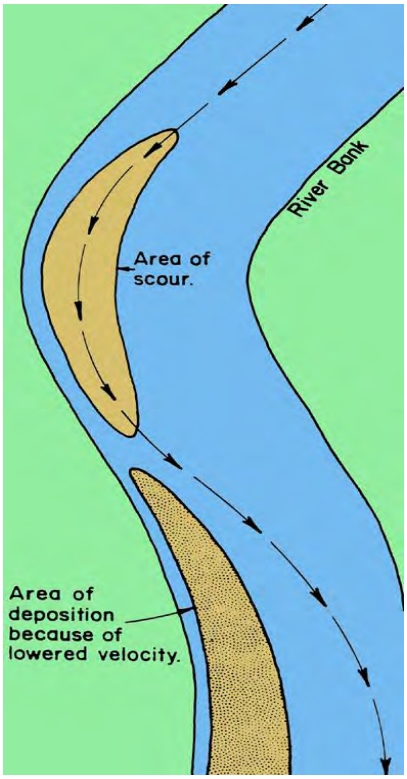


Figure 8-14. As a result of erosion on the outer bank and accretion on the inner bank, the river moves outward and down the valley.



While the processes of erosion and accretion typically occur simultaneously, soil is being deposited (accreted) on the inside of the bend in the stream (left bank), soil is scoured (eroded) from the right bank and may be deposited (accreted) further down the stream.

Courtesy of 2009 BLM Manual of Surveying Instructions

Reliction

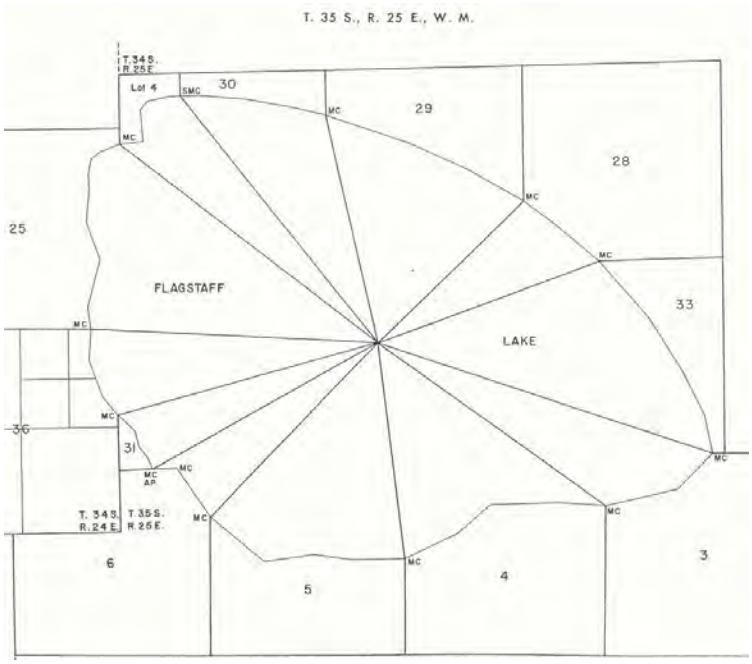
Reliction is the formation of dry land by the slow and imperceptible withdrawal of water from the shores of a river or lake (occurs most frequently along a lake) and the ownership to the new dry land area follows the same principles as those used in the ownership of accreted lands. The 2009 Manual of Surveying Instructions defines reliction as:

> …the gradual uncovering of land caused by the lowering of the ordinary level or stage of a body of water, usually by climatic change or by gradual increase in use of water upstream

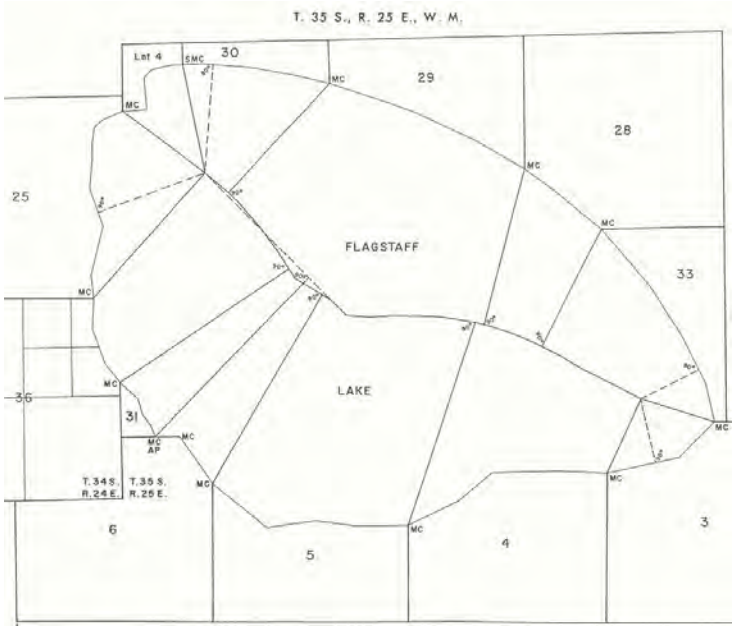
The common law supplies a moving boundary rule and the legal effect is that the upland owner is constantly gaining property as their water boundary is exposed to the flowing waters. Reliction will result in a corresponding shift in the boundary and the new lands must be divided by the same principles of apportioning.

Sometimes reliction is referred to as emergence or as dereliction. For legal purposes, the reliction will begin when the vegetation and other evidence for the line of ordinary high water move into the

exposed areas. The typical seasonal drawdown or a drought of a short duration would not be considered as reliction.



Example division of relicted lake bed by "Pie Method"



Example division of relicted lake bed by "Long Lake Method"

Courtesy of BLM Public Lands Surveying – A Case Book

Legal principals

Washington court decisions relating to the accreted lands or relicted lands have taken an approach, more consistent with federal law, which awards accretions to the adjacent owners. At the same time, the courts recognize that the endless variations of shorelines within this state will present many questions concerning ownership, which cannot be determined by any one fixed rule, however elastic. There are situations where the strict application of the common law principal is rejected in order to preserve access to the water.

This statement was relied upon in the 1973 case of *Hudson House v. Rozman* that concerned accretions at the mouth of the Copalis River. In this example, accretions to the ocean beach diverted the river to the north eventually replacing ocean frontage on the north side of the river with river frontage. The court stated "In such cases the fundamental consideration of preserving frontage on the water will override the usual rule by which accretions belong to the land to which they adjoin." and the court extended the southerly boundary of the property on the north side (a WA state park) of the river across the river to the ocean.

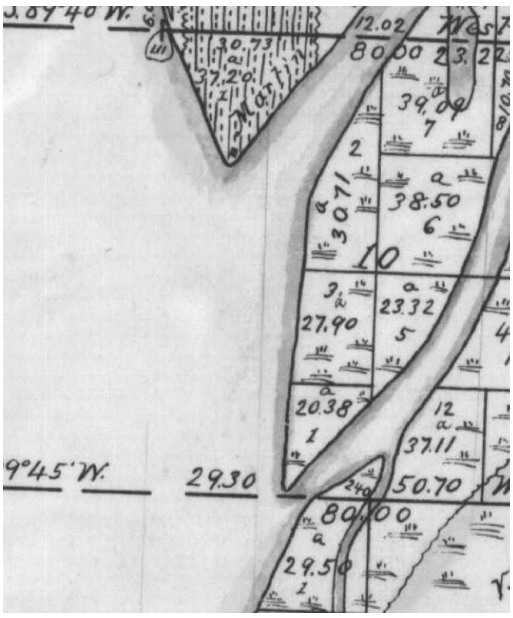
Accretion - A special case in Washington Legislation

The typical common law principal is that the accretions must attach to the upland, which was bounded by the waters which formed the accretion. But in the case of batture (often called accretions) that attach to submerged lands, Washington State has adopted statutes that can deprive the tidelands and shoreland owner from gaining title to the batture (accretions). This provision would also apply to islands that emerge from the bed of a river.

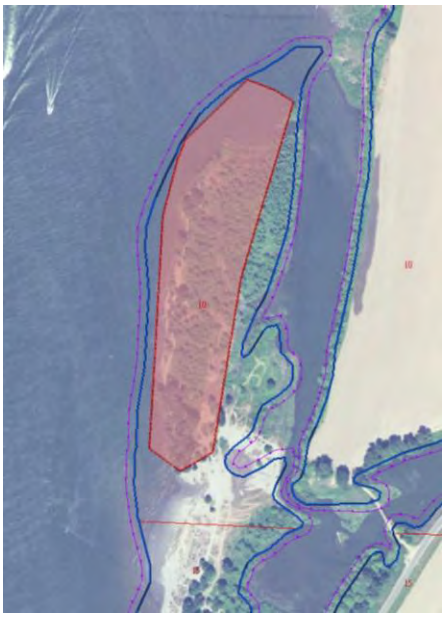
In RCW 79.125.440, Tidelands or shorelands — Accretions — Lease; states, "accretions that may be added to tracts of tide or shore lands heretofore sold or that may hereafter be sold, by the state shall belong to the state". It seems that this law would deny tideland or shoreland owner's accretions, thus possibly cutting off their waterfront access.

As a practical matter, the only reasonable application of RCW 79.125.440 might be in the case of accretions to tide or shoreland tracts that were surveyed and platted or described by metes and bounds. The typical sale of second class tidelands and shorelands that were described as fronting and abutting a portion of the meander line; it would be very difficult to apply this provision without the benefit of a survey performed at the time of sale.

Aquatic lands where this RCW could be applied are detached tidelands and shorelands (sand bars or low islands) that were separated from the upland by navigable waters and were sold at five dollars per acre. Each sale required a survey, a plat, and a legal description provided by the applicant. It is very common to find these parcels in the Columbia River and the parcels were used for fish wheels or duck hunting, etc. These detached parcels (excluding oyster lands) do exist throughout Puget Sound in some of the shallow portions of bays.



GLO Plat from 1854



Pratt Island sold as detached tidelands

The 1946 Washington Supreme Court case of *Ghione v. St*ate recognized that this statute applies only to accretions that occur after the tidelands or shorelands are sold. It also held that the statute does not contemplate "accretions in the ordinary sense of the term, that is, accretions to uplands, but, on the contrary, relates to accretions to tide and shorelands, and therefore accretions, by definition, situate below the line of ordinary high tide or ordinary high water."

In the example above, those accretions that attached to the detached tidelands known as Pratt Island would be state owned aquatic lands. The common law principal where accretions attach to the abutting owner would not apply.

Apportioning of Accretion and Reliction

In dividing the accretion or reliction among the various riparian owners on the same side of the body of water, the objective is to do so with equity and justice to each owner. Two primary factors must be considered in making the equitable distribution, which are:

1) The owners shall have an equal share, in proportion to the length of the newly form lands.

2) To preserve access to the water.

If the parties are unable to agree to the location of a common boundary line between their respective tidelands or shorelands, that line may be determined only by a survey made in accordance with the rules as governed by common law guidelines and principles. The four basic methods formulated to achieve equity and justice is:

1) The proportionate shoreline method is to apportion the new frontage along the water boundary in the same ration as that along the line of the old water boundary. Certain modifications may be required where peninsulas or bays would make strict apportionment inequitable. This method is used by the Federal government and by a majority of the States and is outlined in the 2009 Manual of Surveying Instructions in Section 8-133. This section is based on the 1861 federal case of *Johnson v. Jones* that states "Apportionment of accreted lands is usually made by proportioning the new frontage in the same ratio as the frontage of the old shore".

   Each upland owner is entitled to an equitable share in the adjoining accreted lands having regard only to the length of the shoreline. Therefore the direction of the division lines is derived by the general rule for apportioning and each owner is entitled to a length of shoreline at the new OHW line that is in proportion to the original length of the old OHW.

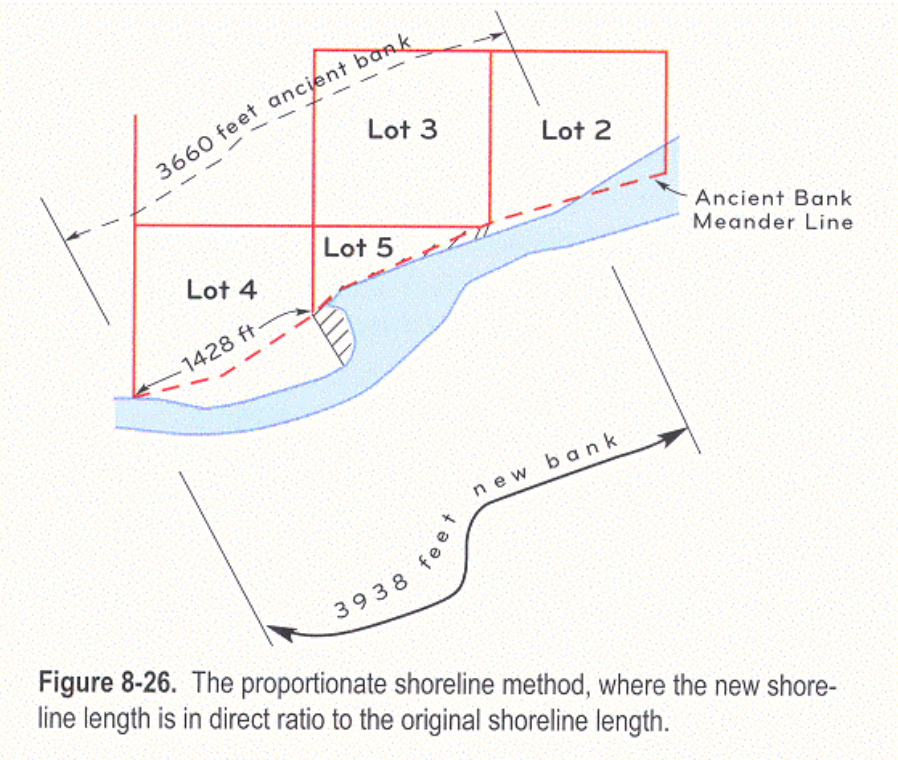
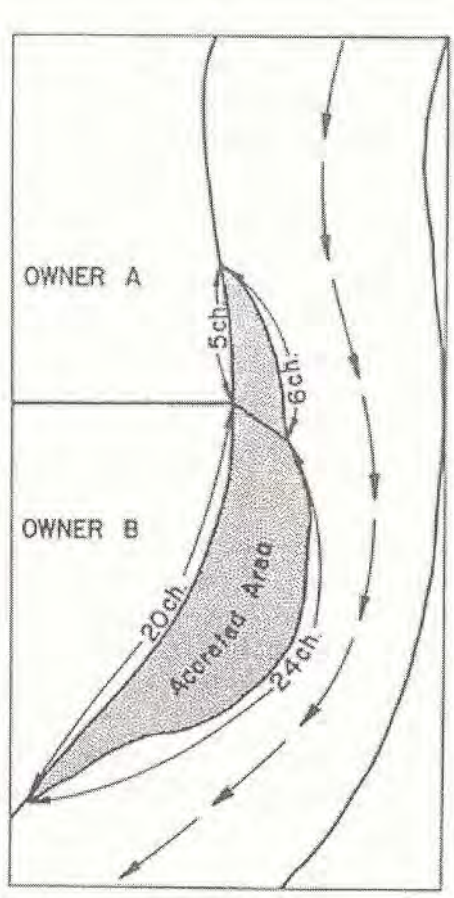


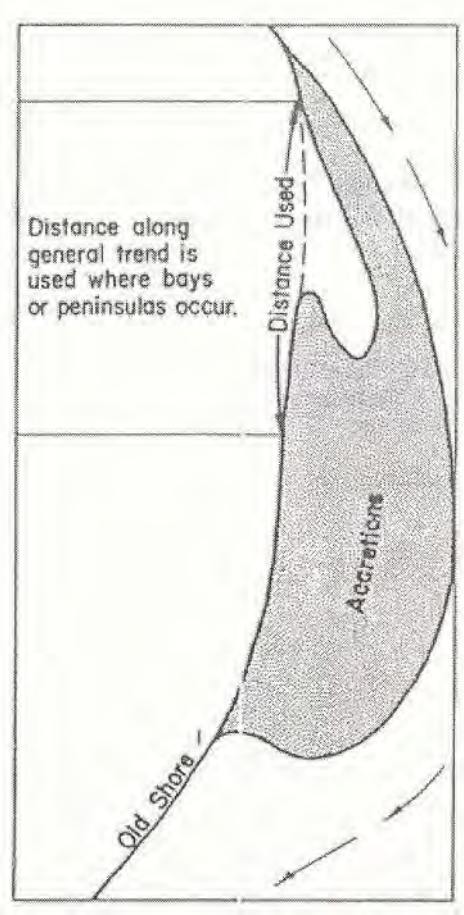
Figure 8-26. The proportionate shoreline method, where the new shoreline length is in direct ratio to the original shoreline length.

Solution for GL4: 3938'(1428'/3660') = 1536' (39%)

Courtesy of 2009 BLM Manual of Surveying Instructions



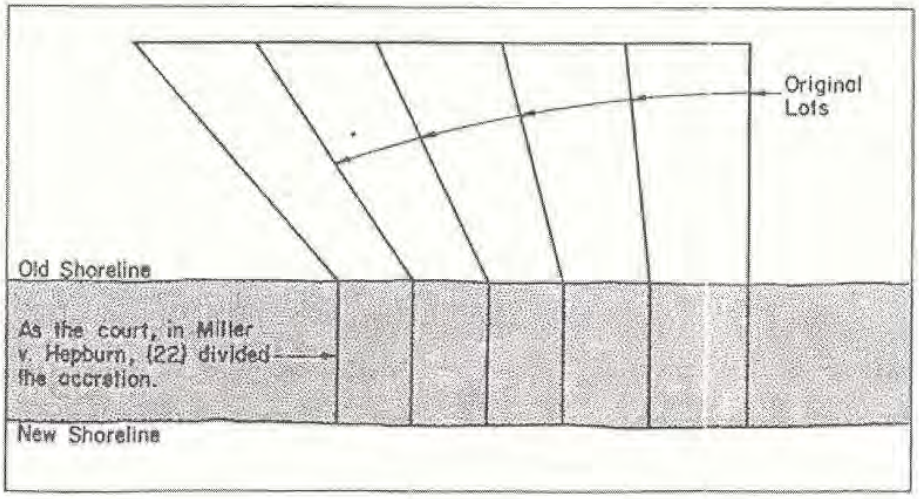
Typical method of proportioning



Modifications required for irregular lines of OHW.

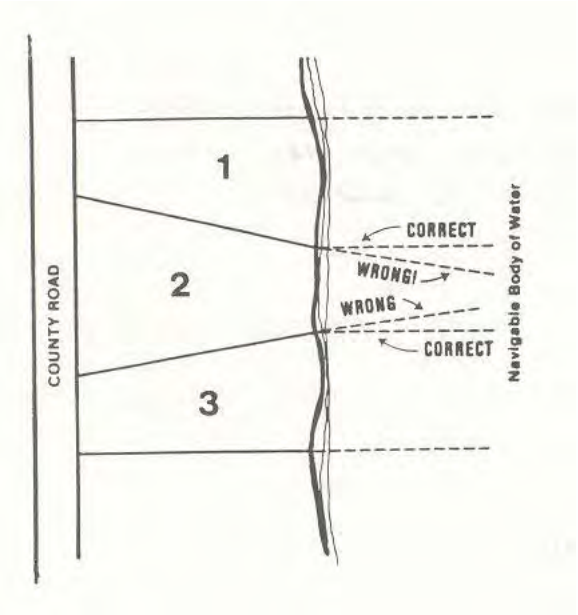
Courtesy of 1973 BLM Manual of Surveying Instructions

2) The perpendicular method or radial lines on curves is whereby a line is drawn from the boundary termination point on the original shoreline perpendicular to the thread of the stream or the new shoreline, depending on the ownership of the land under the water. This method is also the preferred method used to divide the stream bed between riparian owners on a non navigable stream.



The perpendicular method; courtesy of 1973 BLM Manual of Surveying Instructions

3) The prolongation of the property line method is to simply extend the property line until they reach the new water's edge, but this method is rarely used since the method is unlikely to provide equity and justice.

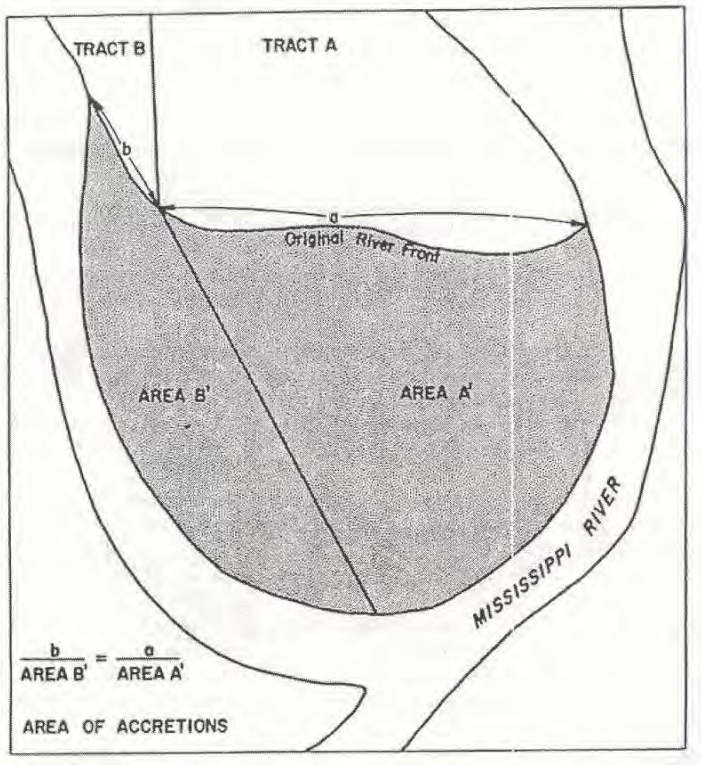


4)

Differences between the perpendicular method and the upland extension method.

Courtesy of 1973 BLM Manual of Surveying Instructions

4) The proportion acreage method has been used where the accreted land is more valuable than the waterfront. In this method contiguous riparian owners each take their proportionate share based upon the total extent of their front lines related to the total quantity of accreted land to be divided.



The proportion acreage method; Courtesy of 1973 BLM Manual of Surveying Instructions.

Rapid and Perceptible Changes

Avulsion

In contrast, in the case of changes to a water body where the changes are rapid and perceptible, the common law principle for avulsion will not result in a shift in the boundary line. Avulsion causes the removal of a considerable quantity of soil from the land of one owner and deposits it upon the dry land of another or when an area is cut-off. This may be a sudden or rapid change in the course and channel of a river or the sudden creation of a completely new channel. It is distinguished from accretion and erosion by the time element.

The 2009 Manual of Surveying Instructions defines avulsion as:

…the sudden and perceptible change in a channel of a boundary stream with a new channel and remaining "fast" land between, or a comparable change in some other body of water forming a boundary owing to natural causes or from the result of human activity.

The legal effect is that each landowner's boundary is fixed at its location as of the date of the avulsive event and the avulsion is complete when no water flows in the abandoned channel. Prior to the avulsive event, the abutting owners owned to the original banks and they will continue to own to the original banks after the avulsion so boundaries do not change. This concept was also discussed in the case of *Nebraska v. Iowa*, 143 U.S. 359 (1892):

> "It is equally well settled, that where a stream, which is a boundary, from any cause suddenly abandons its old and seeks a new bed, such change of channel works no change of boundary; and that the boundary remains as it was, in the center of the old channel, although no water may be flowing therein. This sudden and rapid change of channel is termed, in the law, avulsion."

In the case of a navigable river, the state remains the owner of the original river bed as it existed prior to the avulsion and the land positioned under the new channel is still owned by the person who owned the lands prior to the avulsion, but the lands are subject to a public easement for navigation. If a stream is non navigable, the owners on each side of the stream own to the center of the stream before the avulsion and they continue to own to the center of the dry streambed.

While Washington courts have not specifically ruled as to whether or not the common law rule of avulsion applies to navigable waters in this state, there is no reason to suspect it would not apply. On navigable rivers this leaves the state with ownership of the abandoned bed, but creates the question of whether the state also owns the new bed because it is now the bed of the navigable river. For example, in the 1978 case of *State v. Corvallis Sand & Gravel Co*, Oregon contended that the state owned all beds and shores of navigable waters regardless of accretion or avulsion, but the Oregon court determined that the state did not own the bed of the Willamette River in its present location, where the change resulted from avulsive action.

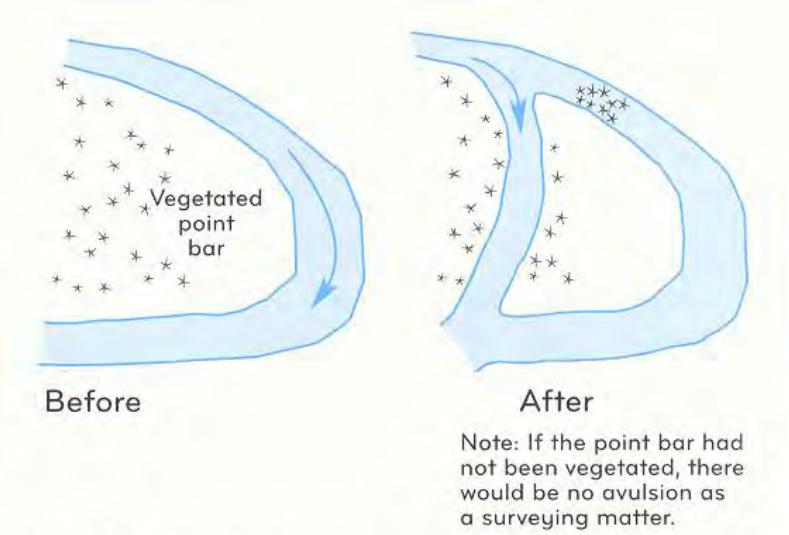


Figure 8-22. During high water events, large amounts of water cut across point bars and can scour out a new channel.

There may be a problem determining whether an avulsion has occurred and the legal effect to the boundaries is a definite requirement. Section 8-97 of the 2009 Manual of Surveying Instructions has the following in regards to determining the changes in the boundary of riparian lands:

"An avulsive change cannot be assumed to have occurred without positive evidence. Positive evidence is direct proof of the facts establishing that an avulsion has occurred and does not arise from any presumption. When no such showing can be made, it must be presumed that the changes have been caused by erosion and accretion.

A change in course of a stream is clearly avulsive when the land between the old and new channels remains substantially as it was. The unaltered condition of the land may be indisputably shown by the continued existence of improvements in place or of timber, undergrowth, and other vegetation."

The initial challenge in an investigation is rather the occurrence is legally classed as an avulsion. Investigative methods used to make a determination are by age dating vegetation, old newspaper accounts about flood events, historical aerial photos, eye witness accounts, old surveys, and testimony. Another challenge is to determine with certainty the position of the river prior to the avulsion and it is difficult to distinguish between accretions that occurred along the abandoned channel from the effect of avulsion. Finding the upstream and downstream limits of the avulsion is puzzling and there is little legal guidance on the selection of the limits.

Surveys of an avulsive event and the changes to the landscape require an extensive investigation and there are many complexities when surveying along land bounded by water. An avulsion could have occurred at some time in the past, and the natural processes of erosion and accretion continued after the avulsion. All these processes need to be considered when a land survey is performed along a riparian boundary.

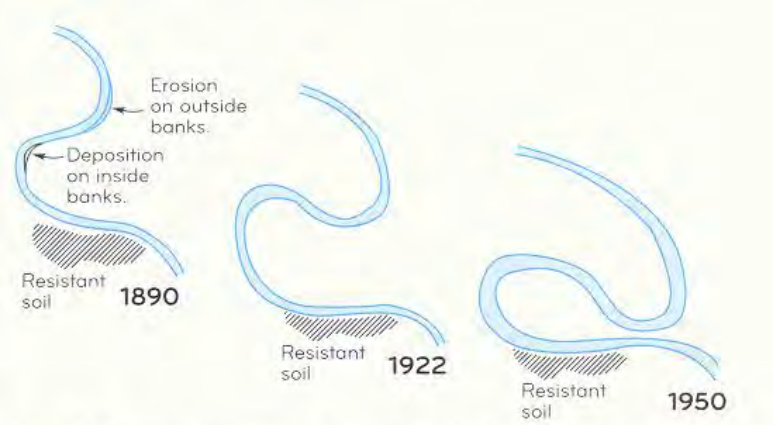


Figure 8-16. The beginnings of an avulsion. River meanders move outward and downstream unless they are impeded by a solid object such as extremely resistant soil or rock.

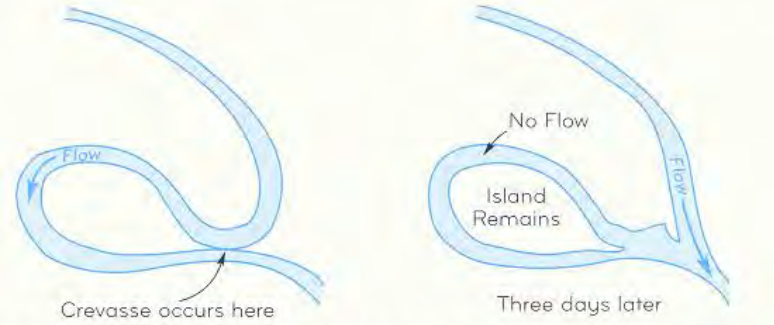


Figure 8-17. As the meander loops tighten, the narrow neck finally breaks through and the eroding waters tear out the "shortcut."

Courtesy of 2009 BLM Manual of Surveying Instructions

Inundation

Inundation is the flooding of uplands and aquatic lands by the construction of dams, locks, or other structures and is treated like an avulsion, whereby the property boundaries remain fixed. The proponent(s) of an inundation project will be required to compensate the existing owners and in the case of state owned aquatic lands, must obtain a right to overflow easement for the state owned beds and shores that will be flooded.

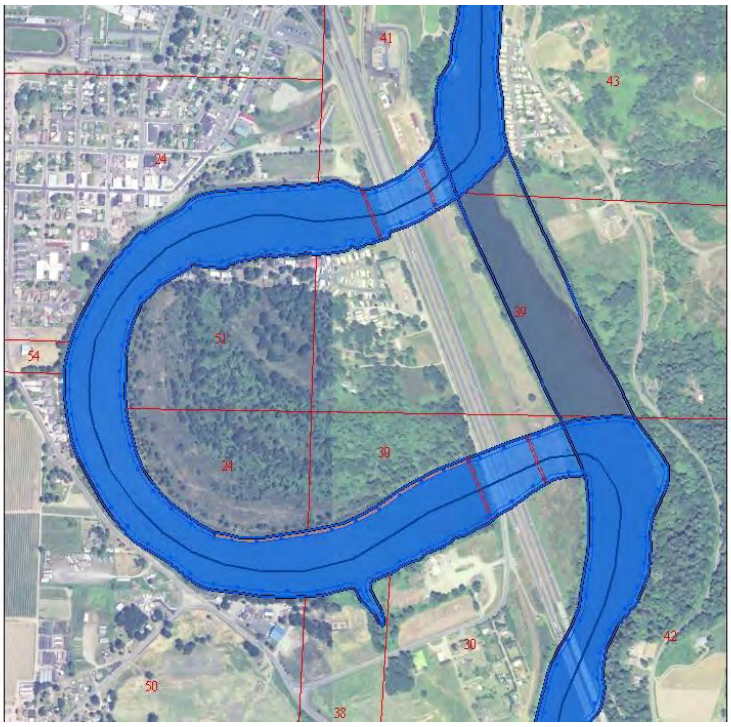
An example is Lake Tapps in Pierce County that was expanded for power generation by diversion of waters from the White River via a canal that begin outside of Buckley.

Lake Tapps in Pierce County based upon 1872 GLO meanders.

Excavation of Canals and Waterways

At many locations in the State, canals or waterways were constructed for various project benefits; either for improving a waterway, for flood control, or highway alignments, etc. Often, these construction projects were authorized by either special legislation or a quasi-government entity such as a Commercial Waterway or Port District or by authorities granted to state agencies.

For example, WSDOT was assigned the duties of the former Canal Commission, which include “construct, maintain, and/or operate any navigation canal, or navigation canal systems deemed feasible by the department of transportation.” The powers and duties are found in RCW 47.72, which define a "Canal is any waterway for navigation created by construction of reservoirs or construction of channels by excavation in dry ground, in streams, rivers or in tidal waters and any existing waterway incorporated into such a canal and including any appurtenant features necessary for operation and maintenance of the canal.”



Lewis River bypass is not State owned aquatic lands!

Most citizens are aware of the Lake Washington Ship Canal, but many other canals were constructed that today appear as a natural water feature. For example, the Lewis River bypass channel for I-5 located at Woodland, WA. At this site, a 2200 foot long bypass was excavated across uplands to bypass the large oxbow bend known today as Horseshoe Lake. Much of the material was used to fill the bed of the old river for the Interstate 5 and to improve the Woodland State Airport, which is a WSDOT managed airport. As a result of this canal, the county boundary between Cowlitz County and Clark County remain along the centerline of the original channel, which is within Horseshoe Lake. Those lands located on the “island” lying west of I-5 are still Clark County residents.

Woodland State managed airport with the Lewis River bypass is NOT the Lewis River.

Exceptions to the Common Law Rules

When first class tidelands lie between the line of ordinary high water and the inner harbor line, accretions that occur within a harbor area would not attach to the abutting parcel because preservation of the platted harbor area is necessary and is protected under Article 15 of the Washington Constitution. The area lying between harbor lines (the inner and outer harbor lines) shall not be sold or granted by the state, nor its rights to control the area shall not be relinquished, but such area shall be forever reserved for landings, wharves, streets, and other conveniences of navigation and commerce."

However, even this principal has its own exception; when the inner harbor line is established by the State to coincide with the line of ordinary high water, then the inner harbor line would be considered as an ambulatory boundary when accretion, erosion, or reliction occurs.

Conclusion

The rules pertaining to accretion, reliction, and avulsion should not be mechanically applied, but rather each case must be decided on its own facts and owners must be afforded equitable treatment. These common law rules are followed in the United States with some modifications to fit special circumstances.

Appendix

Court Citations

The principles of aquatic boundary location in Washington are largely derived from case law. The cases listed below obviously do not comprise the whole body of case law regarding aquatic land boundaries, but these were selected to highlight the courts emphasis on equity for all affected parties and to point out some of the complexities that may be encountered when dealing with tide and shoreline boundaries.

The courts have provided general guidelines for dealing with some potentially very complex situations. They even warn that these guidelines may not meet all conditions. A person working with boundaries around navigable water is advised to exhaustively research laws, courts decisions, and historical deeds and other records and finally to make the decision based on equitable treatment of ALL affected property owners.

Court Cases by Topic

Chapter 2: History of Aquatic Lands

Pollard v. Hagan, 44 U.S. (3 How.) 212 (1845)
Shivley v. Bowlby, 152 U.S. (10 Wall.) 1 (1894)

Chapter 3: Riparian Rights

Shively v. Bowlby, 152 U.S. 1 (1894)
Eisenbach v. Hatfield, 2 Wn. 236, 26 P. 539 (1891)
State v. Sturtevant, 76 Wn. 158, 135 P. 1035 (1913)
Harris v. Hylebos Industries, Inc, 81 Wn. 2d 770, 505 P. 2d 457 (1973)
Orion Corp. v. State, 109 Wn.2d 621, 747 P.2d 1062 (1987),
Wilbour v. Gallagher, 77 Wn. 2d 306, 462 P. 2d 232 (1969)

Chapter 4: The Importance of Navigability for Title Purposes

United States v Utah, 283 U.S. 64, 75 (1931)
Daniel Ball v. U.S., 77 U.S. 557 (1870)
Montebello v. U.S., 87 U.S. (20 Wall) 430 (1874)
U. S. v. Holt State Bank, 270 U.S. 49 (1926)
U.S. v. Appalachian Electric Power Co, 311 U.S. 377 (1940)
Phillips Petroleum Co. v. Mississippi, 484 U.S. 469 (1988)
Griffith v. Holman, 23 Wn. 347, 63 P. 239 (1900)
Proctor v. Sim, 134 Wn. 606, 236 P. 114 (1925)
Watkins v. Dorris, 24 Wn 636, 64 P. 840 (1901)
Kemp v. Putman, 47 Wn. 2d 530, 288 P. 2d 837 (1955)

Chapter 5: Federal Lands and Surveys by the General Land Office (GLO)

Scurry v. Jones, 4 Wn 468, 30 P. 726 (1892)
Mann v. Tacoma Land Co., 153 U.S. 273 (1893)
Kneeland v. Korter, 40 Wn. 359, 82 P. 608 (1905)
Brace and Hergert Mill Co. v. State, 49 Wash. 326, 95 Pac. 278 (1908)
Kalin v. Lister, 27 Wn 2d 785, 180 P. 2d 86 (1947)
Narrows Realty Co. v. State, 52 Wn. 2d 843, 329 P. 2d 836 (1958)
Stockwell v Gibbons, 58 Wn. 2d 391, 363 P.2d 111 (1961)
Smith Tug & Barge Co. v. Columbia - Pacific Towing Corp., 78 Wn 2d 975, 482 P. 2d 769 (1971)
Thein v. Burrows, 13 Wn App. 761, 537 P. 2d 1064 (1975)
Commissioners of Land Office of Oklahoma, et al, v USA, 270 F 110

Chapter 6: Tides and Tidal Datum

Borax Consolidated Ltd. v. City of Los Angeles, 296 U.S. 10, 56 S.Ct. 23, 80 L.Ed. 9 (1935)
U.S. Court of Appeals (9th) in United States v. State of Washington, 294 F2d 830, 834 (1961)

Chapter 7: Tidelands

Hughes v. State of Washington, 67 Wn. 2d 799, 410 P. 2d (1966), Rev. 389 U.S. 290 (1967)
Borax Consolidated v. City of Los Angles, 296 U.S. 10 (1935)

Chapter 8: Lateral /Sideline Boundaries for Aquatic lands

Spath v. Larsen, 20 Wn 2d 500, 148 P. 2d 834 (1944)
State v. Corvallis Sand and Gravel, 69 Wn 2d 24, 416 P. 2d 675 (1966)

Chapter 9: Oyster Lands

Pearl Oyster Co. v. Heuston, 57 Wn. 533, 107 P. 349 (1910)

Chapter 10: Harbor Areas, Waterways, and Streets

Eisenbach v. Hatfield, 2 Wn 236, 26 P. 539 (1891)
Davidson v. State, 116 Wn. 2d 13, 802 P. 2d 1374 (1991)
Chlopeck Fish Co. v. City of Seattle, 64 Wn. 315, 117 P. 232 (1911)
State v. Savidge, 95 Wn. 240, 163 P. 738 (1917)
Draper Machine Works v. Depart. of Natural Resources, 117 Wn. 2d 306, 815 P. 2d 770 (1991)

Chapter 11: Shorelands

Austin v. Bellingham, 69 Wn. 677, 126 P. 59 (1912)
Puget Mill Co. v. State, 93 Wn. 128, 160 P. 310 (1916)
State v. Sturtevant, 76 Wn. 158, 135 P. 1035 (1916)

Chapter 12: Shifting Boundaries on Aquatic Lands

Hughes v. Washington, 67 Wn. 2d 799, 410 P. 2d 20 (1966)
Hughes v. Washington, 385 U.S. 290 (1967)
Hudson House v. Rozman, 82 Wn 2d 178, 509 P. 2d 992 (1973)
Ghione v. State, 26 Wn 2d 635, 175 P. 2d 955 (1946)
Johnston v. Jones, 66 U.S. 209 (1861)
Merryman v. Goins, 124 P. 2d 729 (1942)
Miller v. Hepburn, 71 KY 326 (1871)
Wood v. Appal, 63 Pa. 210 (1869)
Jones v. Hogue, 129 So. 2d. 194 (1960)
Parker v. Farrell, 74 Wn. 2d 553, 445 P. 2d 620 (1968)
Harper v. Holston, 119 Wn. 437, 205 P. 1062 (1922)
State (Oregon) v. Corvallis Sand & Gravel Co., 582 P. 2d 1352 (1978)
Strand v. State, 16 Wn. 2d 107, 132 P. 2d 1011 (1943)
Spath v. Larsen, 20 Wn 2d 500, 148 P. 2d 834 (1944)
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Tidelands, Shorelands, and Riparian Boundaries by Leroy F. Middleton, PLS

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Waterfront Titles in the State of Washington by George N. Peters Jr. for Chicago Title Insurance Co., 2004

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Water Boundaries by George M. Cole, 1997

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Aquatic Land Statutes

Constitution of the State of Washington

Article XV	Harbors and Tide Lands
Article XVII	Tidelands
Article XXVII	Territorial Grants of Tidelands and Shorelands Voided

Administrative Codes

WAC 332-28	Harbor Line Commission
WAC 332-30	Aquatic Land Management

Aquatic Lands Statues

RCW 79.100	Aquatic Laws – Derelict Vessels
RCW 79.105	Aquatic Lands - In General
RCW 79.110	Aquatic Lands - Easements and Right of Ways
RCW 79.115	Aquatic Lands - Harbor Areas
RCW 79.120	Aquatic Lands - Waterways and Streets (also see RCW 35.79.035-.040; RCW 35.21.23-.250)
RCW 79.125	Aquatic Lands - Tidelands and Shorelands
RCW 79.130	Aquatic Lands - Beds of Navigable Waters
RCW 79.135	Aquatic Lands – Oysters, Geoducks, Shellfish, other Aquacultural Uses, and Marine Aquatic Plants
RCW 79.140	Aquatic lands -- Valuable materials
RCW 79.145	Aquatic Lands - Marine Plastic Debris

General Public Lands Statutes

RCW 43.30	Department of Natural Resources
RCW 79.01	Public Lands Act
RCW 79.02	Public Lands Management - General
RCW 79.10	Land Management Authorities and Policies
RCW 79.11	State Land Sales
RCW 79.13	Land Leases
RCW 79.36	Easements over Public Lands
RCW 79.38	Access Roads

Related Statues

RCW 79A.05.600	Seashore Conservation Area
RCW 79A.55	Scenic River System
RCW 85	Diking & Drainage Districts
RCW 86	Flood Control
RCW 87	Irrigation
RCW 88	Navigation and Harbor Improvements
RCW 90	Water Rights-Environment
RCW 90.58	Shoreline Management Act of 1971
RCW 91.08	Public Waterways

Note: The above list only includes laws, which relate to aquatic lands administered by the DNR. There are many more related RCW's and WAC's, which are administered by other agencies. During the 2005 legislative session, a bill was passed to re-codify many of the Aquatic land Statutes, therefore references to old chapter numbers and section numbers may be called for in many publications.