- Meetings may be viewed on the City of Anacortes website, on the City of Anacortes YouTube Channel, or on TV Channel 10.
- The public may also watch or listen to the meeting live by visiting https://us02web.zoom.us/j/85918981678 or by telephoning 1-253-215-8782 and entering Meeting ID 859 1898 1678.
- Listen to the meeting by phone: 872-240-3412, Access Code: 261-991-485
- The public is encouraged to comment via email to pced@cityofanacortes.org, via written comment addressed to PCED, P.O. Box 547, Anacortes, WA 98221, or via e-comment (https://www.anacorteswa.gov/700/Watch-Meetings - click on meeting you wish to provide comment and in upper right corner is an option to include Public Comment). Public comments received prior to 3:00 p.m. the day of the meeting will become part of the record for the meeting, just as if presented in person.
- Complete guidelines for virtual participation in Anacortes Planning Commission meetings are available here (page 2). View the quick video example for connecting to the meeting here.

ANACORTES PLANNING COMMISSION

October 27, 2021

~~**Municipal Building Council Chambers**~~
~~**6th Street and "Q" Avenue**~~
** This meeting will be held electronically only **

AGENDA

6:00 PM

VIEW PACKET MATERIALS HERE

A. Roll Call

B. Minutes

1) Draft Minutes of 10/13/2021

C. Correspondence

D. New Business

E. Old Business

1) Continued Public Hearing - Flood Plain Management Amendments- Anacortes Municipal Code Chapter 19.74

The City of Anacortes encourages people with disabilities to participate in public meetings. For assistance with special needs, please contact the City Clerk at 360-299-1960 in advance of the meeting.

Planning Commission Public Hearing Minutes for October 13, 2021

This is not a verbatim transcript of the meeting and is written to capture the general spirit of the discussion based upon notes and video observation by the author. To view the video recording of this meeting, click here, or go to https://www.anacorteswa.gov/700/Watch-Meetings.

Commission Chair MacKenzie called the Public Hearing of October 13, 2021, to order at 6:00 p.m.

Roll Call:

Members Present: Commissioners Mike Cortright, Gary Molyneaux, Sarah Ruether, Frank Jeretzky, Linda Martin, Ward MacKenzie. Commissioner Jeff Graf attended the meeting at a later time,

Members Absent: none

Staff Present: Don Measamer, Emily Morgan, Joann Stewart

Minutes: The minutes from September 22, 2021, were accepted as submitted.

Correspondence: No additional correspondence other than the items currently on the agenda. Commissioner Cortright requested that the agenda items be switched to have the dock presentation first and the bonus height discussion last as it would take more time. All Commissioners in attendance agreed on this and the agenda items were switched.

Old Business: No old business to discuss.

New Business: *Public Hearing, SDP-2021-0008 – Delmar/Brownson Dock Replacement*

Emily Morgan, PCED Senior Planner, gave a PowerPoint presentation on the SPD-2021-008, providing the project history, public notice requirements, and stating the Staff's recommendation for approval with conditions. At 6:22pm Chair Mackenzie opened the public hearing for comments. Comments were received by:

- Logan Brown, 313 East F Street, Tacoma, WA – Mr. Brown is the General Manager of Marine Floats, the agency hired to perform this work. Mr. Brown thanked the City of Anacortes staff and agrees with the staff report and is available for any questions.

Commissioners discussed the proposal and size of float. With no public comments received, Chair MacKenzie closed the public hearing at 6:17pm. Commissioner Jeretzky made a motion to approve the project as submitted. Commissioner Cortright seconded the motion. Commissioners voted 6-0 to approve SDP-2021-0008 as presented.

Bonus Height provisions in the R4 Use Zone, AMC 19.50.42 C, concept discussion
Director Don Measamer presented the bonus height provisions in the R4 Use Zone, AMC 19.50.42 C. Mr. Measamer provided a brief description of the provision and the moratoriums that have been put in place. Mr. Measamer provided there are 7 different concepts that the Commissioners will begin reviewing along with a summary of the comments received to date. Additional comments were submitted this week and are included in the final packet as well as provided directly to the Commissioners.

With no further discussion, Chair MacKenzie concluded the meeting at 7:24.

Planning Commission Agenda Bill

Meeting Date: October 27, 2021 **Agenda Item:** E.1.

Subject: Continued Public Hearing - Flood Plain Management Amendments- Anacortes Municipal Code Chapter 19.74

Staff Contact: DON MEASAMER

Approved for Submittal to Commission by	**Action Type**
Joann Stewart	Public Hearing
LIBBY GRAGE	

Summary Statement: Previously titled Frequently Flooded Areas under AMC Chapter 17.17.020 was first established approximately 1994 and updated with minor changes 2005 and 2008 and established by the Flood Insurance Study for the City of Anacortes dated March 17, 2003 with accompanying Flood Insurance Maps (FIRM) and has not been updated since. In early 2021, the City was contacted by David Radabaugh, National Flood Insurance Program (NFIP) Coordinator, Department of Ecology, regarding updates to the City Flood Plain Management regulations. Mr. Radabaugh reviewed the existing code sections and provided several updates to ensure consistency with current FEMA and NFIP guidelines.
The City has contracted with Jim Johannssen, Coastal Geologic Services, for a report regarding Sea Level rise and its effects on coastal areas in Anacortes. Mr. Johannessen will provide a presentation on Sea Level rise and the potential freeboard above Base Flood Elevation of more than one foot.

Background: Flood Plain Management amendments, AMC Chapter 19.74 was first presented at the July 28, 2021 Planning Commission Public Hearing. The Public Hearing has remained open and City Staff have received no public comments to date.

Previous Action: NA

Competing Viewpoints Considered: Yes

Recommended Motion: Recommend approval to the City Council

Alternative Actions: Revise as needed bring back for review

Attachments (listed in order presented):

1. Flood Plain Management Chapter 19.74
2. CAO Memo - Draft Update Coastal Geologic Services
3. Hearing Notice

Chapter 19.74 Floodplain Management ~~Article II. Frequently Flooded Areas~~ (FEMA Approved)

~~17.70.020~~ 19.74.010 ~~———~~Statutory authorization, findings of fact, purpose, and objectives.

A. *Statutory Authorization.* The legislature of the state of Washington has delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the City Council of Anacortes does ordain as follows:

1. *Findings of Fact.*

   a. The flood hazard areas of Anacortes are subject to periodic inundation which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

   b. These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards which increase flood heights and velocities and, when inadequately anchored, damage uses in other areas. Uses that are inadequately flood-proofed, elevated, or otherwise protected from flood damage also contribute to the flood loss.

2. *Statement of Purpose.* It is the purpose of this chapter to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

   a. To protect human life and health;

   b. To minimize expenditure of public money and costly flood control projects;

   c. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

   d. To minimize prolonged business interruptions;

   e. To minimize damage to public facilities and utilities, such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in areas of special flood hazard;

   f. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

   g. To ensure that potential buyers are notified that property is in an area of special flood hazard;

   h. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions; and

   i. To incorporate LID BMPs if feasible.

3. *Methods of Reducing Flood Losses.* In order to accomplish its purposes, this chapter includes methods and provisions for:

   a. Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

   b. Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

   c. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters;

   d. Controlling filling, grading, dredging, and other development which may increase flood damage; and

   e. Preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or may increase flood hazards in other areas. (Ord. 3031 § 1 (Exh. A), 2018; Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005*)

~~* Code reviser's note: Ord. 3031, Section 3, states: "This ordinance shall be effective for six months from the date of adoption, and the provisions provided in Exhibit A shall expire on May 19, 2019."~~

~~17.70.030~~ 19.74.020 Definitions.

Unless specifically defined below, words or phrases used in this chapter shall be interpreted so as to give them the meaning they have in common usage and to give this chapter its most reasonable application.

"Adjacent/regulated slopes" means within 100 feet of the project site boundaries.

"Administrator" means the Director of Community Development.

"Alteration of watercourse" Any action that will change the location of the channel occupied by water within the banks of any portion of a riverine waterbody.

"Appeal" means a request for a review of the interpretation of any provision of this chapter or a request for a variance.

~~"Area of shallow flooding" means a designated AO, or AH Zone on the Flood Insurance Rate Map (FIRM). The base flood depths range from one to three feet; a clearly defined channel does not exist; the path of flooding is unpredictable and indeterminate; and, velocity flow may be evident. AO is characterized as sheet flow and AH indicates ponding.~~

"Area of shallow flooding" A designated zone AO, AH, AR/AO or AR/AH (or VO) on a communities Flood Insurance Rate Ma (FIRM) with a one percent or greater annual chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow. Also referred to as sheet flow area.

~~"Area of special flood hazard" means the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. Designation on maps always includes the letters A or V.~~

"Area of special flood hazard" The land in the floodplain within a community subject to a 1 percent or greater chance of flooding in any given year. It is shown on the Flood Insurance Rate Map (FIRM) as zone A, AO, AH, A1-30, AE, A99, AR, (V, VO, V1-30, VE). "Special flood hazard area" is synonymous in meaning with the phrase "area of special flood hazard".

"Base flood" means the flood having a one percent chance of being equaled or exceeded in any given year. Also referred to as the "one hundred-year flood." Designation on maps always includes the letters A or V.

"Base Flood Elevation (BFE)" The elevation to which floodwater is anticipated to rise during the base flood.

"Basement" means any area of the building having its floor subgrade (below ground level) on all sides.

"Breakaway wall" means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.

"Buffer" means a naturally vegetated area or vegetated area established or managed to protect nontidal wetlands or other areas from human disturbances.

~~*Buffer Strip.* The term's~~ "Buffer Strip" means the ~~intended~~ purpose ~~is~~ to provide a sight, sound, and/or psychological barrier between land uses with a high degree of incompatibility, whether real or perceived.

"Channel" means the geographical area within either the natural or artificial banks of a watercourse or drainway.

"Coastal high hazard area" means an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1-30, VE or V.

"Creation, wetland" means a human activity bringing a wetland into existence at a site in which it did not formerly exist.

"Critical facility" means a facility for which even a slight chance of flooding might be too great. Critical facilities include, but are not limited to, schools, nursing homes, hospitals, police, fire and emergency response installations, installations which produce, use or store hazardous materials or hazardous waste.

"Development" means any human-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials located within the area of special flood hazard.

"Drainway" means any depression below the surrounding land serving to give direction to a regular current of water and having a bed and well-defined banks.

"Elevated building" means for insurance purposes, a nonbasement building which has its lowest elevated floor raised above ground level by foundation walls, shear walls, post, piers, pilings, or columns.

"Existing manufactured home park or subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the adopted floodplain management regulations.

"Expansion to an existing manufactured home park or subdivision" means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

"Flood" or "flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from:

1. The overflow of inland or tidal waters; and/or
2. The unusual and rapid accumulation of runoff of surface waters from any source.
3. Mudslides (i.e., mudflows) which are proximately caused by flooding and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as with when earth is carried by a current of water and deposited along the path of the current.
4. The collapse of subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unforeseeable event which results in flooding.

"Flood elevation study" means ~~A~~an examination , evaluation and determination of flood hazards and, if appropriate , corresponding water surface elevations, or an examination , evaluation and determination of mudslides (i.e., mudflow) and/or flood-related erosion hazards. Also known as a Flood Insurance Study (FIS).

"Flood Insurance Rate Map (FIRM)" means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community. A FIRM that has been made available digitally is called a Digital Flood Insurance Rate Map (DFIRM)

"Flood Insurance Study" means the official report provided by the Federal Insurance Administration that includes flood profiles, the flood boundary-floodway map, and the water surface elevation of the base flood.

"Floodplain or flood-prone area" means a~~A~~ny land area susceptible to being inundated by water from any source. See "Flood or flooding"

"Flood proofing" ~~A~~means any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate risk of flood damage to real estate or improved real property, water and sanitary facilities, structures, and their contents. Flood proofed structures are those that have the structural integrity and design to be impervious to floodwater below the Base Flood Elevation

"Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than ~~one foot~~. a designated height. Also referred to as "Regulatory Floodway".

"Functionally dependent use" ~~A~~means a use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, and does not include long-term storage or related manufacturing facilities.

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~~"~~Function/wetlands" means the beneficial roles nontidal wetlands serve, including storage, conveyance, and attenuation of floodwaters and stormwaters; groundwater recharge and discharge; protection of water quality and reduction of sediment and erosion; production of waterfowl, game and nongame birds, mammals, and other living resources; protection of habitat for rare, threatened, and endangered species, food chain support for a broad range of wildlife and fisheries; educational, historical, and archaeological value protection; and scenic, aesthetic, and recreational amenities.

"Highest adjacent grade" ~~T~~means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

"Historic structure" means a~~A~~ny structure that is;

1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of Interior as meeting the requirements for individual listing on the National Register.

2. Certified or preliminarily determined by the Secretary of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary of the Interior to qualify as a registered historic district.

3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of Interior; or

4. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either;

   a) By an approved state program as determined by the Secretary of the Interior., or

   b) Directly by the Secretary of the Interior in states without approved programs.

"Hydrophytic vegetation" means macrophytic plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

"In-kind construction, wetland" means the restoration or creation of a wetland with vegetation and other characteristics closely approximating those of a specified wetland.

"Lowest floor" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than

a basement area, is not considered a building's lowest floor, provided that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirements of this chapter found at subsection 19.74.050.D

"Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

"Manufactured home park or subdivision" means a parcel (or contiguous) of land divided into two or more manufactured home lots for rent or sale.

"Mean Sea Level" for~~For~~ purpose of the National Flood Insurance Program, means the vertical datum to which Base Flood Elevations shown on a community's Flood Insurance Rate Map are referenced.

~~"New construction" means structures for which the "start of construction" commenced on or after the effective date of the ordinance codified in this chapter.~~

"New construction" f~~F~~or the purposes of determining insurance rates, means structures for which the "start of construction" commenced on or after the effective date of an initial Flood Insurance Rate ap or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For floodplain management purposes, "new construction", means structures for which the "start of construction" commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures.

"New manufactured home park or subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of adopted floodplain management regulations.

"Nontidal wetland" means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions (commonly known as hydrophytic vegetation).

"Off-site construction, wetland" means restoration or creation of a wetland at a location not adjacent to a previously specified wetland.

"Out-of-kind, wetland" means the restoration or creation of a wetland with vegetation or other characteristics not resembling those of a specified wetland.

"Partially developed lot" means a lot or parcel of land on which a building is located and which is of sufficient area so as to be capable of subdivision into two or more lots in accordance with city standards.

"Practicable alternative, wetland" means an alternative to the proposed project that would accomplish the basic purpose of the project and avoid or have less adverse impact on a nontidal wetland.

"Recreational vehicle" means a vehicle which is:

1. Built on a single chassis;

2. Four hundred square feet or less when measured at the largest horizontal projection;
3. Designed to be self-propelled or permanently towable by a light duty truck; and
4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

“Regulated activity, wetlands” means an activity with a significant impact on nontidal wetlands, including:

1. The removal, excavation, or dredging of soil, sand, gravel, minerals, organic matter, or materials of any kind;
2. The changing of existing drainage characteristics, sedimentation patterns, flow patterns, or flood retention characteristics;
3. The disturbance of the nontidal wetland water level or water table by drainage, impoundment, or other means;
4. The dumping or discharging of material, or the filling of a nontidal wetland with material;
5. The placing of fill or the grading or removal of material that would alter existing topography;
6. The driving of piles, placement of obstructions, and erection or repair of buildings or structures of any kind;
7. The destruction or removal of plant life that would alter the character of a nontidal wetland; and
8. The conduct of an activity that results in a significant change of water temperature, a significant change of physical or chemical characteristics of nontidal wetland water sources, or the introduction of pollutants.

“Regulated slopes” means slopes that average 15 percent or greater over a vertical interval of 10 feet.

“Restoration, wetland” means a human activity that returns a wetland or former wetland from a disturbed or altered condition with lesser acreage or functions to a previous condition with greater wetland acreage or functions.

“Scientist, professional wetland” means a professional wetland scientist shall be certified through the Society of Wetland Scientists Professional Certification Program.

“Start of construction” includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement or other improvement was within one hundred eighty days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of

any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

"Structure" means a walled and roofed building including a gas or liquid storage tank that is principally above ground.

"Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed fifty percent of the market value of the structure before the damage occurred.

~~"Substantial improvement" means any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds fifty percent of the market value of the structure either:~~

~~1. Before the improvement or repair is started; or~~

~~2. If the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.~~

~~The term does not, however, include either:~~

~~1. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or~~

~~2. Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.~~

"Substantial Improvement" means a~~A~~ny reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either:

1.) Any project for improvement of a structure to correct previously identified existing violations of state or local health, sanitary, or safety code specifications that have been identified by the local code enforcement official and that are the minimum necessary to assure safe living conditions; or

2) Any alteration of a historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure".

"Variance" means a grant of relief from the requirements of this chapter which permits construction in a manner that would otherwise be prohibited by this chapter.

"Water dependent" means a structure for commerce or industry which cannot exist in any other location and is dependent on the water by reason of the intrinsic nature of its operations. ~~(Ord. 3040 § 2 (Att. A), 2019; Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005; Ord. 2316 § 3, 1994)~~

~~17.70.040~~ 19.74.030 General provisions.

A. *Lands to Which This Chapter Applies.* This chapter shall apply to all areas of special flood hazards within the jurisdiction of the City of Anacortes.

B. *Basis for Establishing the Areas of Special Flood Hazard.* The areas of special flood hazard identified by the Federal Insurance Administration in a scientific and engineering report entitled "The Flood Insurance Study for the City of Anacortes" dated March 17, 2003, and any revisions thereto, with an accompanying Flood Insurance Rate Map (FIRM), and any revisions thereto, are hereby adopted by reference and declared to be a part of this chapter. The Flood Insurance Study and the DFIRM are on file at 904-6th Street. The best available information for flood hazard area identification as outlined in subsection 19.74.040.(C)(2)~~17.70.050(C)(2)~~ of this chapter shall be the basis for regulation until a new FIRM is issued which incorporates the data utilized under subsection 19.74.040.(C)(2) ~~17.70.050(C)(2)~~ of this chapter.

C. *Penalties for Noncompliance.* No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this chapter and other applicable regulations. Violations of the provisions of this chapter by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions), shall constitute a misdemeanor. Any person who violates this chapter or fails to comply with any of its requirements shall upon conviction thereof be fined not more than one thousand dollars or imprisoned for not more than ten days, or both, for each violation, and in addition shall pay all costs and expenses involved in the case. Nothing herein contained shall prevent the Administrator from taking such other lawful action as is necessary to prevent or remedy any violation.

D. *Abrogation and Greater Restrictions.* This chapter is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this chapter and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

E. *Interpretation.* In the interpretation and application of this chapter, all provisions shall be:

1. Considered as minimum requirements;
2. Liberally construed in favor of the governing body; and
3. Deemed neither to limit nor repeal any other powers granted under state statutes.

F. *Warning and Disclaimer of Liability.* The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This chapter does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not create liability on the part of the

city of Anacortes, any officer or employee thereof, or the Federal Insurance Administration, for any flood damages that result from reliance on this chapter or any administrative decision lawfully made hereunder.~~ (Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005)~~

~~17.70.050~~ 19.74.040 Administration.

A. Establishment of development permit.

1. *Development Permit Required.* A development permit shall be obtained before construction or development begins within any area of special flood hazard established in subsection ~~17.70.040(B)~~ 19.74.030 (B) of this chapter. The permit shall be for all structures including manufactured homes, as set forth in the "Definitions," and for all development including fill and other activities, also as set forth in the "Definitions."

2. *Application for Development Permit.* Application for a development permit shall be made on forms furnished by the city of Anacortes and may include, but not be limited to, plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area in question; existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing. Specifically, the following information is required:

   a. Elevation in relation to mean sea level, of the lowest floor (including basement) of all structures;

   b. Elevation in relation to mean sea level to which any structure has been floodproofed;

   c. Certification by a registered professional engineer or architect that the floodproofing methods for any nonresidential structure meet the floodproofing criteria in subsection ~~17.70.060(B)(2)~~ 19.74.050 (B)(2) of this chapter; and

   d. Description of the extent to which a watercourse will be altered or relocated as a result of proposed development.

B. *Designation of the Local Administrator.* The administrator is hereby appointed to administer and implement this chapter by granting or denying development permit applications in accordance with its provisions.

C. *Duties and Responsibilities of the Local Administrator.* Duties of the administrator shall include, but not be limited to:

1. *Permit Review.*

   a. Review all development permits to determine that the permit requirements of this chapter have been satisfied.

   b. Review all development permits to determine that all necessary permits have been obtained from those federal, state, or local governmental agencies from which prior approval is required.

   c. Review all development permits to determine if the proposed development is located in the floodway. If located in the floodway, assure that the encroachment provisions of subsection ~~17.70.060(D)~~ 19.74.050(D) of this chapter are met.

2. Use of Other Base Flood Data (In A and V Zones). When base flood elevation data has not been provided (A and V Zones) in accordance with subsection ~~17.70.040(B)~~ 19.74.030(B), basis for establishing the areas of special flood hazard, the administrator shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal, state or other source, in order to administer subsection ~~17.70.060(B)~~ 19.74.050(B), specific standards, and subsection ~~17.70.060(D)~~19.74.050(D) ~~,~~ critical facility.

3. Information to be Obtained and Maintained.

   a. Where base flood elevation data is provided through the Flood Insurance Study, FIRM, or required as in subsection (C)(2) of this section, obtain and record the actual elevation (in relation to mean sea level) of the lowest floor (including basement) of all new or substantially improved structures, and whether or not the structure contains a basement.

   b. For all new or substantially improved floodproofed structures where base flood elevation data is provided through the Flood Insurance Study, FIRM, or as required in subsection (C)(2) of this section:

      i. Obtain and record the elevation (in relation to mean sea level) to which the structure was floodproofed; and

      ii. Maintain the floodproofing certifications required in subsection (A)(2)(c) of this section.

   c. Maintain for public inspection all records pertaining to the provisions of this chapter.

4. *Alteration of Watercourses.*

   a. Notify adjacent communities and the Department of Ecology prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration.

   b. Require that maintenance is provided within the altered or relocated portion of said watercourse so that the flood carrying capacity is not diminished.

5. *Interpretation of FIRM Boundaries.* Make interpretations where needed, as to exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). The person contesting the location of the boundary shall be given a reasonable opportunity to appeal the interpretation as provided ~~in subsection (D) of this section.~~ in Table 19.20.030, Type I Administrative Ministerial Actions, and Section 19.20.180.

D. *Variance Procedure.*

1. Variances to this chapter must be processed according to the procedures in Title 19.

2. *Conditions for Variances.*

   a. Generally, the only condition under which a variance from the elevation standard may be issued is for new construction and substantial improvements to be erected on a lot of one-half acre or

less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing items ~~(i through xi)~~ in subsection ~~(D)(1)(d)~~ (D)(3)(a) of this section have been fully considered. As the lot size increases the technical justification required for issuing the variance increases.

b. Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in this section~~.~~ Upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

c. Variances shall not be issued within a designated floodway if any increase in flood levels during the base flood discharge would result.

d. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

e. Variances shall only be issued upon:

i. A showing of good and sufficient cause;

ii. A determination that failure to grant the variance would result in exceptional hardship to the applicant;

iii. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.

iv. A demonstration that no net loss of critical areas functions and values will occur as a result.

f. Variances as interpreted in the National Flood Insurance Program are based on the general zoning law principle that they pertain to a physical piece of property; they are not personal in nature and do not pertain to the structure, its inhabitants, economic or financial circumstances. They primarily address small lots in densely populated residential neighborhoods. As such, variances from the flood elevations should be quite rare.

g. Variances may be issued for nonresidential buildings in very limited circumstances to allow a lesser degree of floodproofing than watertight or dry-floodproofing, where it can be determined that such action will have low damage potential, complies with all other variance criteria except subsection (D)(2)(a) of this section, and otherwise complies with subsections ~~17.70.060(A)(1)~~ 19.74.050(A)(1), (~~3~~) (a) and ~~(4)~~ (b) of the general standards.

h. Any applicant to whom a variance is granted shall be given written notice that the structure will be permitted to be built with a lowest floor elevation below the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. ~~(Ord. 2992 § 1 (Att. A), 2016; Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005)~~

3. Variance review criteria.

a. In considering variance applications, the governing body must consider all technical evaluations, all relevant factors, all standards specified in other sections of this chapter, and;

i. The danger that materials may be swept onto other lands to the injury of others;

ii. The danger to life and property due to flooding or erosion damage;

iii. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

iv. The importance of the services provided by the proposed facility to the community;

v. The necessity to the facility of a waterfront location, where applicable;

vi. The availability of alternative locations for the proposed use, which are not subject to flooding or erosion damage;

vii. The compatibility of the proposed use with existing and anticipated development;

viii. The relationship of the proposed use to the comprehensive plan and floodplain management program for that area;

~~i.~~ix. The safety of access to the property in time of flood for ordinary and emergency vehicles;

~~ii.~~x. The expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters expected at the site; and

~~iii.~~xi. The costs of providing governmental services during and after flood conditions, including maintenance and repair of public utilities and facilities, such as sewer, gas, electrical, water system, and streets and ~~3. *Variance review criteria*~~

~~1. In considering variance applications, the governing body must consider all technical evaluations, all relevant factors, all standards specified in other sections of this chapter, and;~~

~~a) The danger that materials may be swept onto other lands to the injury of others;~~

~~b) The danger to life and property due to flooding or erosion damage;~~

~~c) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;~~

~~d) The importance of the services provided by the proposed facility to the community;~~

~~e) The necessity to the facility of a waterfront location, where applicable;~~

~~f) The availability of alternative locations for the proposed use, which are not subject to flooding or erosion damage;~~

~~g) The compatibility of the proposed use with existing and anticipated development;~~

~~h) The relationship of the proposed use to the comprehensive plan and floodplain management program for that area;~~

~~i) The safety of access to the property in time of flood for ordinary and emergency vehicles;~~

~~j) The expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters expected at the site; and~~

~~k) The costs of providing governmental services during and fter flood conditions, including maintenance and repair of public utilities and facilities, such as sewer, gas, electrical, water system, and streets and bridges.~~

~~17.70.060~~19.74.050 Provisions for flood hazard reduction.

A. *General Standards.* In all areas of special flood hazards, the following standards are required:

1. *Anchoring.*

   a. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads including effects of buoyancy.~~.~~

   b. All manufactured homes must likewise be anchored to prevent flotation, collapse, or lateral movement, and shall be installed using methods and practices that minimize flood damage. Anchoring methods may include, but are not limited to, use of over-the-top or frame ties to ground anchors (Reference FEMA's "Manufactured Home Installation in Flood Hazard Areas" guidebook for additional techniques).

2. *Construction Materials and Methods.*

   a. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.

   b. All new construction and substantial improvements shall be constructed using methods and practices that minimize flood damage.

   c. Electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

3. *Utilities.*

   a. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems;

   b. The proposed water well shall be located on high ground that is not in the floodway (WAC 173-160-171);

c. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters; and

d. Onsite waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

4. *Subdivision Proposals* *and Other Development*.

a. All subdivision proposals shall be consistent with the need to minimize flood damage;

b. All subdivision proposals shall have public utilities and facilities, such as sewer, gas, electrical, and water systems located and constructed to minimize or eliminate flood damage;

c. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood damage; and

d. Where base flood elevation data has not been provided or is not available from another authoritative source, it shall be generated for subdivision proposals and other proposed developments which contain at least fifty lots or five acres (whichever is less).

5. *Review of Building Permits.* Where elevation data is not available either through the Flood Insurance Study, FIRM, or from another authoritative source (subsection ~~17.70.050(C)(2)~~19.74.040(C (2)), applications for building permits shall be reviewed to assure that proposed construction will be reasonably safe from flooding. The test of reasonableness is a local judgment and includes use of historical data, high water marks, photographs of past flooding, etc., where available. Failure to elevate at least two feet above the highest adjacent grade in these zones may result in higher insurance rates.

B. *Specific Standards.* In all areas of special flood hazards where base flood elevation data has been provided (Zones A1-30, AH, and AE) as set forth in subsection ~~17.70.040(B)~~ 19.74.030(B), basis for establishing the areas of special flood hazard, or subsection ~~17.70.050(C)(2)~~ 19.74.040(C) (2), use of other base flood data (In A and V Zones), the following provisions are required:

1. *Residential Construction.*

a. ~~a)~~ In AE and A1-30 zones or other A zoned areas where the BFE has been determined or can be reasonably obtained, new construction and substantial improvement of any residential structure must have the lowest floor, including basement, elevated one foot or more above the BFE. Mechanical equipment and utilities must be waterproof or elevated at least one foot above BFE.

b. ~~b)~~ New construction and substantial improvement of any residential structure in an unnumbered A zone for which a BFE is not available and cannot be reasonably obtained must be reasonably safe from flooding, but in all cases the lowest floor must be at least two feet above the Highest Adjacent Grade.

c. ~~c)~~ New construction and substantial improvement of any residential structure in a V, V1-30, or VE zone must meet the requirements of section 19.74.050(C Coastal High Hazard.

d. ~~d)~~ Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or must be designed to automatically equalize hydrostatic flood forces on the exterior walls by allowing for the entry and exit of flood waters. Designs must meet or exceed the minimum following criteria or be designed by a registered engineer or architect and certify engineered openings;

i. Have a minimum of two openings with a total net area of not less than one square inch for every square foot of enclosed area subject to flooding.

ii. The bottom of all openings must be no higher than one foot above grade.

iii. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided they permit the automatic entry and exit of floodwater.

iv. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry and exit of floodwaters. ~~a. New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated one foot or more above the base flood elevation.~~

~~b. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria:~~

~~i. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided;~~

~~ii. The bottom of all openings shall be no higher than one foot above grade;~~

~~iii. Openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.~~

2. *Nonresidential Construction.* New construction or substantial improvement of any commercial, industrial, or other nonresidential structure must meet the requirements of subsection a or b, below.

a. ~~1.~~New construction and substantial improvement of any commercial, industrial, or other nonresidential structure must meet all the following requirements.

i. ~~a)~~ In AE and A1-30 zones or other A zoned areas where the BFE has been determined or can be reasonably obtained: New construction and substantial improvement of any commercial, industrial, or other nonresidential structure must have the lowest floor, including basement, elevated one foot or more above the BFE, or elevated as required by ASCE 24, whichever is greater. Mechanical equipment and utilities must be waterproofed or elevated at least one foot above BFE, or as required by ASCE 24, whichever is greater.

ii. ~~b).~~If located in an Unnumbered A zone for which a BFE is not available and cannot be reasonably obtained, the structure must be reasonably safe from flooding, but in all cases the lowest floor must be at least two feet above the Highest Adjacent Grade.

iii. If located in a V, V1-30, or VE zone, the structure must meet the requirements of Section 19.54.050 (C Coastal High Hazard.

iv. If located in a V, V1-30, or VE zone, the structure shall meet the requirements in 19.54.050 (C Coastal High Hazard.

b. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited or must be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of flood forces. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or must meet or exceed the following minimum criteria or be designed by a registered engineer or architect and certify engineered openings:

i. Have a minimum of two openings with a total net area of not less than one square inch for every square foot of enclosed area subject to flooding.

ii. The bottom of all openings must be no higher the one foot above grade.

iii. Openings may be equipped with screens, louvers, valves or other coverings or devices provided that they permit the automatic entry and exit of floodwater.

iv. A garage attached to a to a residential structure , constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry and exit of floodwaters.

c. If the requirements of subsection (a) are not met , then new construction and substantial improvement of any commercial , industrial or other nonresidential structure must meet all the following requirements:

i. Be dry flood proofed so that one foot or more above the base flood level the structure is watertight with walls substantially impermeable to the passage of water or dry flood proofed to the elevation required by ASCE 24, whichever is greater;

ii. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

iii. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications must be provided to the official as set forth in section 17.74.040. (C (3)

iv. Nonresidential structures that are elevated, not flood proofed, must meet the same standards for space below the lowest floor as described in (2) (b) of this section.

v. Applicants who are flood proofing nonresidential buildings must be notified that flood insurance premiums will be based on rates that are one foot below the flood proofed level

(e.g. a building that is flood proofed to the base flood level will be rated as one foot below). Flood proofing the building an additional foot will reduce insurance premiums.

~~New construction and substantial improvement of any commercial, industrial or other nonresidential structure shall either have the lowest floor, including basement, elevated one foot or more above the base flood elevation; or, together with attendant utility and sanitary facilities, shall:~~

~~a. Be floodproofed so that below one foot or more above the base flood level the structure is watertight with walls substantially impermeable to the passage of water;~~

~~b. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;~~

~~c. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the official as set forth in subsection 17.70.050(C)(3)(b) of this chapter;~~

~~d. Nonresidential structures that are elevated, not floodproofed, must meet the same standards for space below the lowest floor as described in subsection (B)(1)(b) of this section;~~

~~e. Applicants floodproofing nonresidential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the floodproofed level (e.g. a building floodproofed to the base flood level will be rated as one foot below).~~

3. *Manufactured Homes.*

   a. All manufactured homes to be placed or substantially improved on sites:

      i. Outside of a manufactured home park or subdivision,

      ii. ~~.~~In a new manufactured home park or subdivision,

      iii. ~~.~~In an expansion to an existing manufactured home park or subdivision, or

      iv. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood;

      v. Shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated one foot or more above the base flood elevation and be securely anchored to an adequately designed foundation system to resist flotation, collapse and lateral movement.

   b. Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision that are not subject to the above manufactured home provisions be elevated so that either:

      i. The lowest floor of the manufactured home is elevated one foot or more above the base flood elevation, or

ii. ~~.~~The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than thirty-six inches in height above grade and be securely anchored to an adequately designed foundation system to resist flotation, collapse, and lateral movement.

4. *Recreational Vehicles.* Recreational vehicles placed on sites are required to either:

a. Be on the site for fewer than one hundred eighty consecutive days;

b. ~~.~~Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions; or

c. ~~.~~Meet the requirements of subsection (B)(3) of this section and the elevation and anchoring requirements for manufactured homes.

5. Enclosed area below the lowest floor:

a. If buildings or manufactured homes are constructed or substantially improved with fully enclosed areas below the lowest floor, the areas must be used for parking of vehicles, building access, or storage.

6. Appurtenant Structures (Detached Garages & Small Storage Structures)

a. Appurtenant structures used solely for parking of vehicles or limited storage may be constructed such that the floor is below the BFE, provided the structure is designed and constructed in accordance with the following requirements:

i. Use of the appurtenant structure must be limited to parking of vehicles or storage;

ii. The portions of the appurtenant structure located below the BFE must be built using flood resistant materials;

iii. The appurtenant structure must be anchored to prevent flotation, collapse, and lateral movement;

iv. Any machinery or equipment servicing the appurtenant structure must be elevated or flood proofed to or above the BFE;

v. The appurtenant structure must comply with floodway encroachment provisions in section 19.74.050 (D):

vi. The appurtenance structure must be designed to allow for the automatic entry and exit of floodwaters in accordance with 1-d of this section:

vii. The structure must have low damage potential:

viii. If the structure is converted to another use, it must be brought into full compliance with standards governing such use:

ix. The structure must not be used for human habitation:

b. Detached garages, storage structures, and other appurtenant structures not meeting the above standards must be constructed in accordance with all applicable standards in section 1-d.

c. Upon completion of the structure, certification that the requirement of this section has been satisfied must be provided to the Floodplain Administrator for verification.

7. AE and A1-30 Zones with Base Flood Elevations but No Floodways

a. In areas with BFEs (when a regulatory floodway has not been designated), no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the communities FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

C. *Coastal High Hazard Areas.* Located within areas of special flood hazard established in subsection ~~17.70.040(B)~~ 19.74.030.B of this chapter are C coastal high hazard areas, designated as Zones V1-30, VE and/or V. These areas have special flood hazards associated with high velocity waters from surges and, therefore, in addition to meeting all provisions in this chapter, the following provisions shall also apply:

~~1. All new construction and substantial improvements in Zones V1-30 and VE (V if base flood elevation data is available) on the community's FIRM shall be elevated on pilings and columns so that:~~

~~a. The bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated one foot or more above the base flood level, and~~

1. All new construction and substantial improvements in zones V1-30 and VE (V if base flood elevation is available) on the communities FIRM must be elevated on pilings and columns so that:

a. For residential buildings the bottom of the lowest horizontal structural member of the lowes floor (excluding the pilings or columns) is elevated one foot or more above the base flood level.

~~a.~~b. For nonresidential buildings the bottom of the lowest horizontal member of the lowest floor (excluding the pilings or columns) is elevated one foot or more above the base flood level or meets the elevation requirements of ASCE 24, whichever is higher.

~~b.~~c. The pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Wind and water loading values shall each have a one percent chance of being equaled or exceeded in and given year (one hundred-year mean recurrence interval).

~~c.~~d. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of this section.

2. Obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures in Zones

V1-30, VE, and V on the community's FIRM and whether or not such structures contain a basement. The administrator shall maintain a record of all such information;

3. All new construction within Zones V1-30, VE, and V on the community's FIRM shall be located landward of the reach of mean high tide;

4. Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with nonsupporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakaway wall shall have a design safe loading resistance of not less than ten and no more than twenty pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of twenty pounds per square foot (either by design or when so required by local or state codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:

   a. Breakaway wall collapse shall result from water load less than that which would occur during the base flood, and
   b. The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and nonstructural). Maximum wind and water loading values to be used in this determination shall each have a one percent chance of being equaled or exceeded in any given year (one hundred-year mean recurrence interval).
   c. If breakaway walls are utilized, such enclosed space shall be useable solely for parking of vehicles, building access, or storage. Such space shall not be used for human habitation.

5. Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM;

6. Prohibit ~~man-made~~ human caused alteration of sand dunes within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage;

7. All manufactured homes to be placed or substantially improved within Zones V1-30, V, and VE on the community's FIRM on sites:

   a. Outside of a manufactured home park or subdivision,
   b. In a new manufactured home park or subdivision,
   c. In an expansion to an existing manufactured home park or subdivision, or
   d. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood;
   e. Meet the standards of subsections (C)(1) through (C)(6) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones V1-30, V, and VE on the FIRM meet the requirements of subsection (B)(3) of this section.

8. Recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either:

    a. Be on the site for fewer than one hundred eighty consecutive days,
    b. Be fully licensed and ready for highway use, on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions, or
    c. Meet the requirements of subsection 17.70.050(A)(1) of this chapter, development permit required and subsection (C)(1) through (C)(6) of this section.

D. *Critical Facility.* Construction of new critical facilities shall be, to the extent possible, located outside the limits of the special flood hazard area (SFHA) (one hundred-year floodplain). Construction of new critical facilities shall be permissible within the SFHA if no feasible alternative site is available. Critical facilities constructed within the SFHA shall have the lowest floor elevated three feet or to the height of the five hundred-year flood, whichever is higher. Access to and from the critical facility should also be protected to the height utilized above. Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters. Access routes elevated to or above the level of the base flood elevation shall be provided to all critical facilities to the extent possible. (Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005)

~~17.70.070~~ 19.74.060 Stand alone ordinance.

This chapter is adopted as a stand alone ordinance will be enforced only in those areas presently identified or become identified as special flood hazard areas within the City of Anacortes. (~~Ord. 2794 § 1 (Att. A), 2008; Ord. 2702 § 3, 2005)~~

~~**The Anacortes Municipal Code is current through Ordinance 3081, passed January 25, 2021.**~~

~~Disclaimer: The city attorney's office has the official version of the Anacortes Municipal Code. Users should contact the city attorney's office for ordinances passed subsequent to the ordinance cited here.~~

~~**Note:** This site does not support Internet Explorer. To view this site, Code Publishing Company recommends using one of the following browsers: Google Chrome, Firefox, or Safari.~~

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memorandum

Date: October 19, 2021

To: City of Anacortes Planning, Community & Economic Development Department, Don Measamer, Director

From: Coastal Geologic Services, Inc.

Re: **City of Anacortes Critical Areas Ordinance Update: Frequently Flooded Areas – DRAFT Update**

Introduction and Purpose

Coastal Geologic Services, Inc. (CGS) was recently contracted by the City of Anacortes to update the City of Anacortes Critical Areas Ordinance Update: Frequently Flooded Areas technical memo written by CGS for the City of Anacortes in January 2017. The original memo was to assist with updating Article II of The City's Critical Areas Ordinance (Anacortes Municipal Code Chapter 19.70, formally 17.70) — Frequently Flooded Areas and included considerations related to sea level rise (SLR). For this update, specifically, CGS has updated the 2017 technical memo using current, best available science for projected SLR rates for the years 2050 and 2100, vertical land motion for the City, other anticipated effects of climate change other than SLR, updated the *Effects of Sea Level Rise* section of the memo and updated COA regulations within this document[1]. This update does not constitute a complete rewrite of the previous memo.

Sea level rise (SLR) is difficult to incorporate into planning documents because of the wide range of projections and the long-term time frame. While planning for the short term may involve more time-intensive updates, costly damage to infrastructure may incur if proper preventative measures are not taken. The City of Anacortes Critical Areas Ordinance (CAO) does not currently address specific levels of projected sea level rise. By incorporating SLR into official planning code, Anacortes is taking important steps toward preparing for the effects of climate change on their frequently flooded areas and creating a safer and more resilient community and environment.

Review of Current CAO

Washington State enacted the Growth Management Act in 1990 requiring each city and county to identify and protect five Critical Areas within their jurisdiction. One of the five critical areas is Frequently Flooded Areas and is characterized as areas within the floodplain that are subject to flooding due to high groundwater, high tides, strong winds, sea level rise and extreme weather events.

Sea level rise is of primary importance for City planning because much of the local floodplain within City limits lies within the coastal zone. A recent ordinance, codified on August 2021, was added to the CAO and includes brief mentions of sea level rise in Chapter 19.70, Article VI Frequently Flooded Areas (FFA). This inclusion states that Washington's coastal areas are impacted by climate change and implores

[1] https://anacortes.municipal.codes/AMC/19_Div7

people seeking development or permit approval within the vicinity of the marine shorelines to become versed with sea level rise and climate change.

This memo briefly examines the significance of floodplains but does not discuss these factors at length because as the Anacortes Shoreline Master Program (SMP) also addresses these issues where floodplains and coastal zones overlap.

Sea Level Rise Best Available Science

Flooding in the City of Anacortes occurs primarily within the coastal zone, which is at the forefront of SLR planning. To understand how these areas could change in the future, it is imperative to consider the most up-to-date research on SLR projections for the region. Below is a review of the best available science from a global, regional, and local perspective.

Global

The Intergovernmental Panel on Climate Change (IPCC) argues that global sea level rose at an increasing rate during the past century, and that this trend will continue over the next century. The IPCC has determined that it is very likely that sea level rose at a rate of 0.67 inches/decade between 1901 and 2010. Observed rates from 1971–2010 and 1993–2010 are roughly 0.79 and 1.26 inches/decade (respectively), whereas predicted rates for high emissions scenarios are between 3.15 to 6.23 inches/decade for 2081–2100 (IPCC, 2014). In the 2007 Synthesis Report, the IPCC projected sea level to rise 7–15 inches for their lowest CO2 emissions scenario and to rise 10–23 inches for their highest emissions scenario by the end of the 21st century (IPCC, 2007). Their 2014 report projects a low estimate of 10–22 inches and a high estimate of 18–32 inches by 2081–2100 (IPCC, 2014).

In the 2014 IPCC Fifth Assessment Report, all climate predictions were based on four emissions scenarios:

1. **RCP2.6** predicts CO_2 concentrations between 430 and 580 ppm by 2100, and incorporates strict policies that significantly cut emissions by as much as 70% by 2050
2. **RCP 4.5** predicts more moderate CO_2 levels between 580 to 720 ppm by 2100
3. **RCP 6.0** predicts a higher moderate concentration of 720 to 1,000 ppm by 2100
4. **RCP 8.5** predicts the highest concentrations of CO_2 at over 1,000 ppm by 2100

The current baseline, with no additional measures to cut emissions or reduce impacts, lies between RCPs 6.0 and 8.5 (IPCC, 2014). All four scenarios are plausible by 2100 but largely depend on critical policy decisions over coming decades.

Another study by the Columbia University Earth Institute and others (Hansen et al., 2016), paints a different picture than the ICPP 2014 report. This report states that if emissions continue to grow, multi-meter sea level rise would become "practically unavoidable, probably within 50-100 years." They found that sea levels 130,000 years ago where +6-9 m higher than current conditions when temperatures were no more than a few tenths of a degree warmer than today.

The most recent IPCC report, the 2021 IPCC Sixth Assessment Report, is approved but still not approved for citation, quotation or distribution as it is still subject to final edits (IPCC et al., 2021a). However, the Summary for Policymakers for this report is available to cite (IPCC et al., 2021b). This summary indicates that global mean sea level increased by 0.2 m (7.9 inches) between 1901 and 2018 and that the average

rate of sea level rise was 1.3 mm/YR (0.05 IN/YR) between 1901 and 1971, increasing to 1.9 mm/YR between 1971 and 2006, and further increasing to 2.7 mm/YR (0.1 IN/YR) between 2006 and 2018 with high confidence. Figure 1 shows the global mean sea level in meters relative to 1900 from the 2021 Summary for Policymakers. Ranges that are "likely" are shown for SSP1-2.6 and SSP3-7.0, with "likely" defined as a 66-100% chance. The dashed line for SSP5 8.5 indicates the potential impacts of "deeply uncertain processes" that constitute a low-likelihood, high-impact ice sheet processes that cannot be rules out.

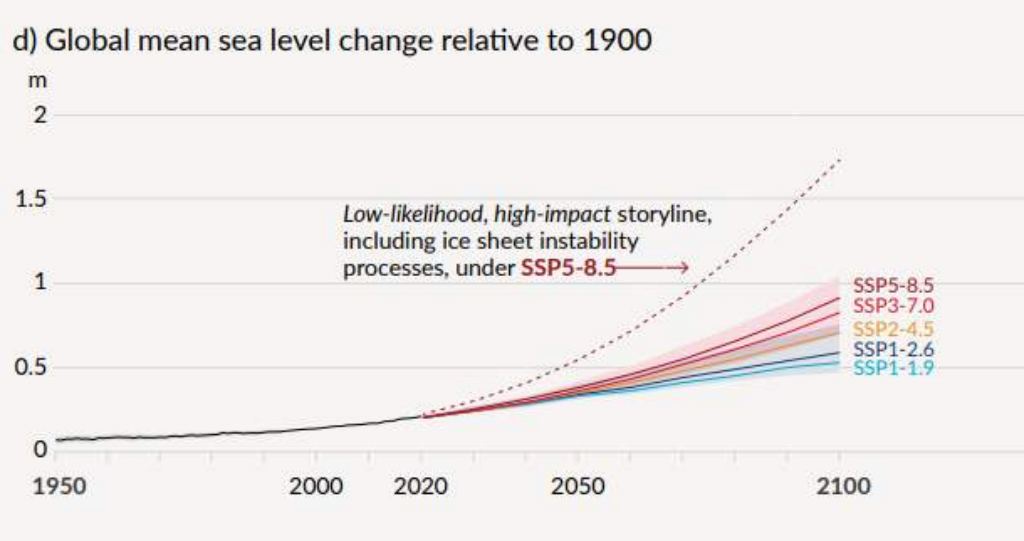


Figure 1. Global mean sea level change in meters relative to 1900 from the 2021 IPCC Sixth Assessment Report Summary for Policy Makers (IPCC et al., 2021b).

The 2007 Fourth Assessment Report did not include certain future effects of ice sheet melting in their projections of sea level rise (SLR) because there was not enough information or understanding of ice sheet dynamics to maintain an acceptable level of confidence (IPCC, 2007, Table SPM.1). The 2014 Fifth Assessment Report incorporated these potential impacts with low confidence levels, but there was still a significant amount of uncertainty, explaining the wide range for each SLR scenario.

There is a huge amount of variability in SLR projections from many regions, but the 2021 Summary for Policy Makers states that "it is virtually certain that global mean sea level will continue to rise over the 21st century" and gives these figures relative to 1995-2014 as likely global mean sea level rise by 2100:

- 0.28-0.55 m (11.0 – 21.65 IN) under the very low greenhouse gas (GHG) emissions scenario (SSP1-1.9)
- 0.32-0.62 m (12.6 – 24.4 IN) under the low GHG emissions scenario (SSP1-2.6)
- 0.44-0.76 m (17.3 – 29.9 IN) under the intermediate GHG emissions scenario (SSP2-4.5)
- 0.63-1.01 m (24.8 – 39.8 IN) under the very high GHG emissions scenario (SSP5-8.5)

And by 2150:

- 0.37-0.86 m (14.6 – 33.9 IN) under the very low scenario (SSP1-1.9)
- 0.46- 0.99 m (18.1 – 39.0 IN) under the low scenario (SSP1-2.6)
- 0.66-1.33 m (26.0 – 52.4 IN) under the intermediate scenario (SSP2-4.5)
- 0.98-1.88 m (38.6 – 74.0 IN) under the very high scenario (SSP5-8.5) (medium confidence).

They also note that "global mean sea level rise above the likely range – approaching 2 m (6.6 FT) by 2100 and 5 m (16.4 FT) by 2150 under a very high GHG emissions scenario (SSP5-8.5) (low confidence) – cannot be ruled out due to deep uncertainty in ice sheet processes" (IPCC et al., 2021b).

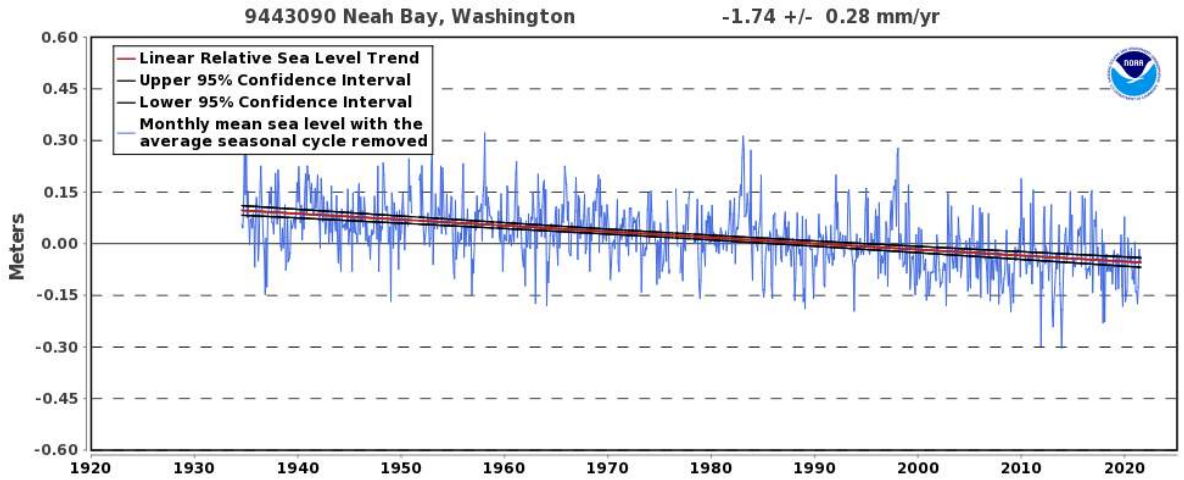
Given the large amount of variation attributed to ocean circulation and atmospheric circulation (e.g., El Nino Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO)), many regions may differ from the global mean in terms of SLR — the Eastern Pacific has been largely at or below the rates of global mean sea level rise since 1993, while projections for the Western Pacific have been significantly higher, sometimes by a factor of three (IPCC, 2014), section 1.1.4). A "medium" estimate presented by Mote et al. (2008) was that these global SLR estimates will be generally consistent with those expected in Puget Sound during this century.

Puget Sound and the Pacific Northwest

Sea level rise estimates for Puget Sound are influenced by a variety of factors, primarily: thermal expansion of the world's oceans, rapid melting of ice-caps and glaciers, local atmospheric impacts such as wind, and local vertical land motion due to plate tectonics (Mote et al., 2008). If sea level rise continues at a constant rate, an extrapolation of tidal gauge records from 1899–2015 would project 6.6 inches of SLR by 2100 (https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=9447130), which does not include any acceleration of local SLR.

Sea level rise effects can vary considerably within Puget Sound due to vertical land motion (VLM). Studies show that Neah Bay is being uplifted as the Juan de Fuca Plate subducts under the North American Plate along the Cascadia Subduction Zone, literally pushing the western Olympic Peninsula upwards (National Research Council, 2012). Uplift is happening at over 0.79 inches/decade — faster than SLR — in Neah Bay. Therefore, relative SLR projections at Neah Bay are negative (Mazzotti et al., 2008). By contrast, Olympia is subsiding, causing sea level rise to have a greater local effect. the City of Olympia is currently planning for 50 inches of sea level rise by 2100. The City of Olympia completed a Sea Level Response Plan that in 2019 (SLR Plan Exec Summary.pdf (revize.com)).

SLR trend data through 2020 is presented in Figure 2 for these 2 stations.



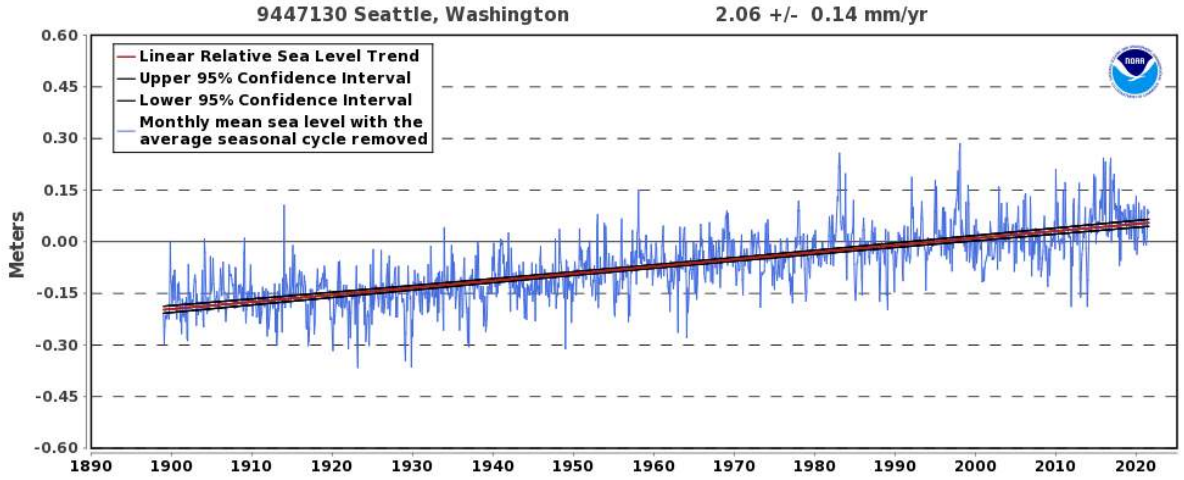


Figure 2. Mean Sea Level (MSL) trend for Neah Bay (top image) and Seattle (bottom image). Neah Bay is experiencing falling sea levels due to the local impact of vertical land motion, whereas in Seattle, relative sea level is rising (NOAA CO-OPS Tides and Currents: https://www.tidesandcurrents.noaa.gov/sltrends/sltrends.html).

In 2018, the Washington Coastal Resilience Network (WCRN) published localized SLR projects in a probabilistic framework for Washington State (Miller et al., 2018). This report provided an updated set of absolute and relative sea level rise projects, out to 2150, at 171 locations across Washington State. Changes in absolute sea level are relative to a "geocentric" reference frame or the center of the earth rather than the elevation of the land surface. Combining absolute sea level change with estimates of vertical land motion (uplift and subsidence) quantifies changes in relative sea level, which is more applicable to community planning as the relative change is what will determine the impacts to land.

These projections incorporated the latest sea level rise science drawing from more recent comprehensive assessment of global and regional sea level rise (Kopp et al., 2014) and recent research indicating the potential for higher SLR in the 21st century. These projections are also spatially variable account for vertical land movement and are probabilistic. The probabilistic approach means that all projections are in terms of probability of exceedance, or the likelihood that SLR will meet or exceed a particular elevation relative to contemporary sea level.

The WCRN projections were developed based on a low (RCP 4.5) and a high (RCP 8.5) greenhouse gas scenario, as shown in Figure 3.

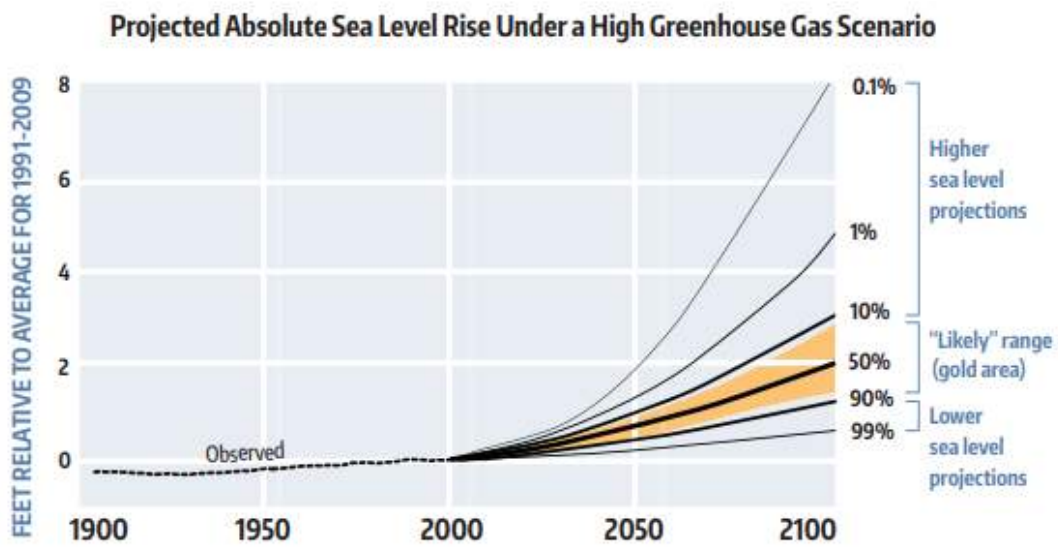


Figure 3. Absolute Sea level rise projections (Figure 2; Miller et al. 2018).

Comparing these projections for 2100, the central estimate of the 2018 projections is lower than the central estimate from the last regional report on sea level rise, 1.6 – 2.0 FT compared to 2.3 FT (National Research Council, 2012). However, the high end (1% probability of exceedance) from the 2018 WCRN report is higher than the 2012 National Research Council, 7.2 – 8.3 FT compared to 4.5 FT.

Anacortes

Skagit County is predicted to experience a similar SLR to the global and regional estimates discussed above, but local impacts may vary. It is helpful to visualize, using data from the NOAA Sea Level Rise Visualization Tool (https://coast.noaa.gov/slr/), how national predictions will impact the City of Anacortes (Figures 3 and 4). It is important to note that this tool is helpful for initial visualization but may not depict how SLR will manifest in this area.

The Geological Survey of Canada used the CAS3D-2 model to predict that Anacortes is experiencing a VLM subsidence rate of -0.34 inches/decade (National Research Council, 2012), with negative values representing subsidence. The VLM reported for Anacortes from the newer, 2018 WCRN report is -0.1 +/- 0.3 FT/century or -0.12 inches/decade (Miller et al., 2018). According to a study by Verdonck (2006), Anacortes is situated roughly between the boundaries of an uplift zone and subsidence zone in Puget Sound, explaining the small rate of vertical land motion.

Figure 3. Low-lying areas currently subject to shallow coastal flooding. The wastewater treatment plant is in a particularly vulnerable area. Note: data are based on local tidal height thresholds from a three year average between 2007 and 2009; current conditions may be different for specific areas (NOAA, 2016).

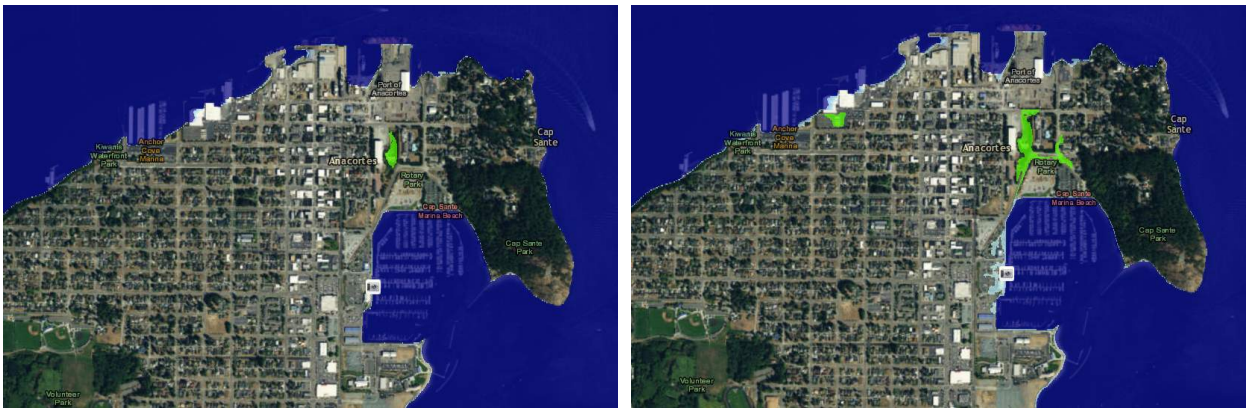


Figure 4. A simulation for downtown Anacortes based on higher sea level rise projections for Puget Sound in the Mote et al. (2008) study: Left panel shows the relative land elevation conditions (green=hydrologically unconnected low-lying areas where water may collect) if sea level rose 2 FT; right panel shows the relative land elevation conditions if sea level rose 4 FT, with much of the port, marina and the wastewater treatment plant in low-lying areas at risk for inundation (light blue=extent of actual inundation). There is not 100% confidence in the mapping techniques or the exact extent of flooding, and the maps do not consider habitat migration or stormwater infrastructure. Simulation from NOAA's Sea Level Rise Visualization Tool.

For this updated analysis, we assessed two scenarios from the 2018 WCRN study based on high greenhouse gas emissions scenario RCP 8.5 for 2050 and 2100. We assessed the 50% and 1% probability of exceedance, or the percent chance that absolute sea level will rise by at least that amount.

We also opted to calculate the inundation during a current extreme coastal water level event for Anacortes and settled on the use of the 20-yr return frequency still water level of 2.9 FT as calculated in Miller et al., 2019 on top of the local mean higher high water (MHHW; Figures 5 and 6).

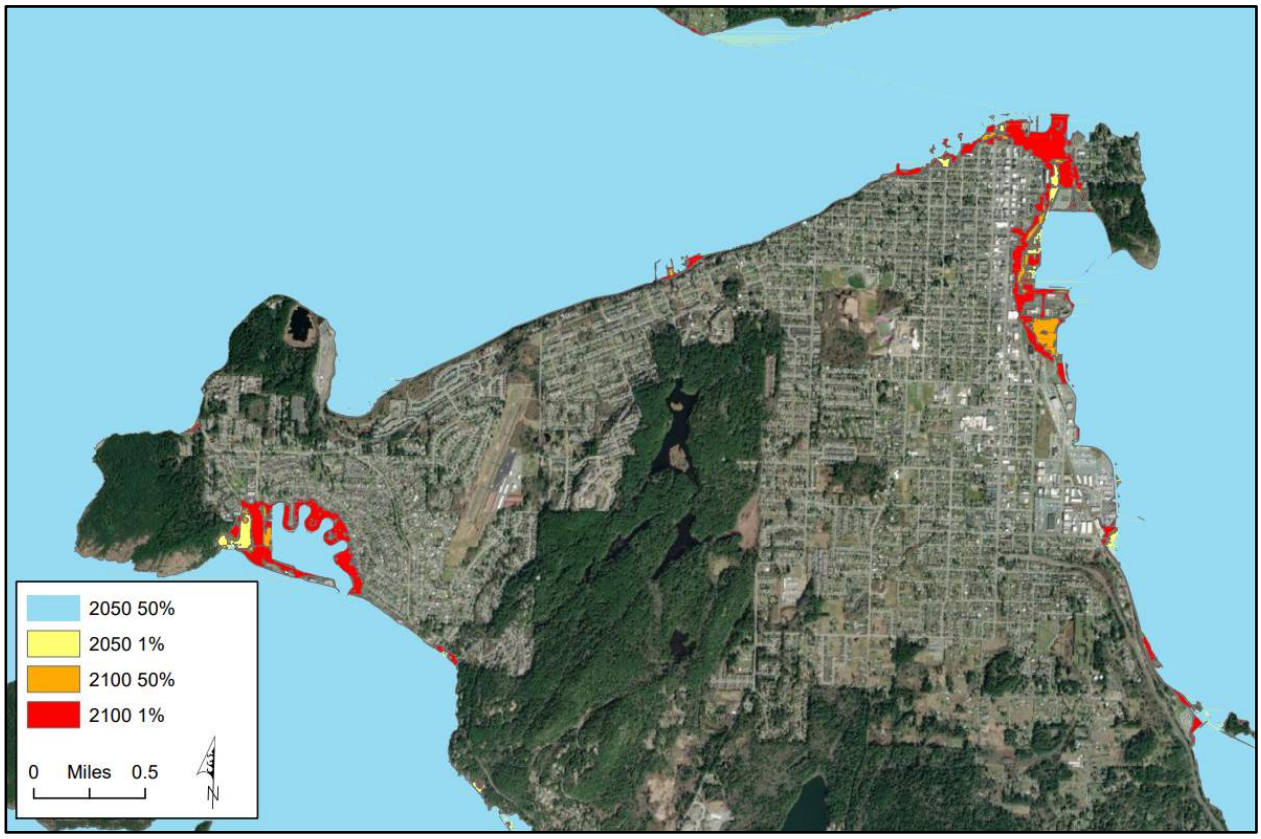


Figure 5. Modeled inundation for the City of Anacortes area for extreme water levels for 2050 and 2100 for low (50%) and high (1%) exceedance probability scenarios. Extreme water levels here are defined as mean higher high water plus the 20-year storm surge (2.9 FT; (Miller et al., 2019), plus localized relative sea level rise projections (Table 1; (Miller et al., 2018)).

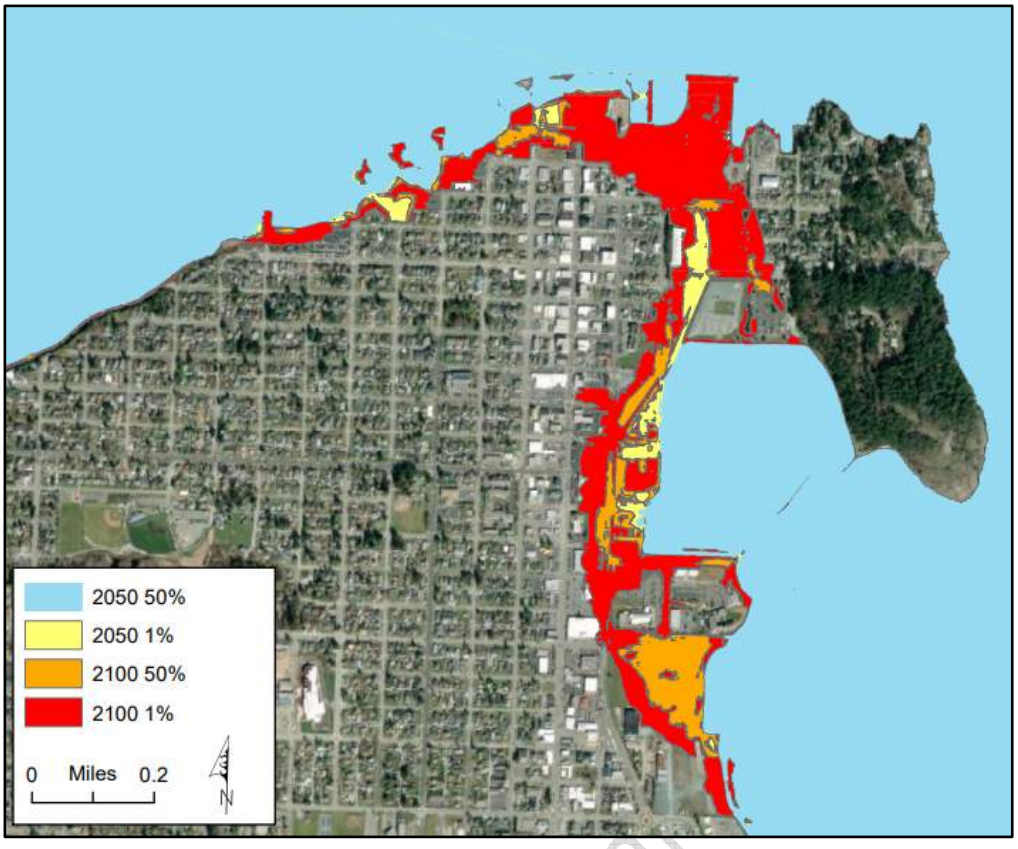


Figure 6. Modeled inundation for the Anacortes downtown area for extreme water levels for 2050 and 2100 for low (50%) and high (1%) exceedance probability scenarios. Extreme water levels here are defined as mean higher high water plus the 20-year storm surge (2.9 FT; (Miller et al., 2019), plus localized relative sea level rise projections (Table 1; Miller et al., 2018).

Table 1. Summary of global and regional sea level rise estimates for 2050 and 2100. Values are in inches.

Region	Source	Scenario	2050	2100
Anacortes	Miller et al. 2018	Medium (RCP 8.5) 50% Exceedance	8.4	25.2
		High (RCP 8.5) 1% exceedance	16.8	58.8
Global	Rahmstorf 2007	-	-	20–55*
Global	IPCC 2007	Low (B1 scenario)	-	7–15
		Med (A1B scenario)	-	8.3–18.9
		High (A1FI scenario)	-	10.2–23.2
Global	IPCC 2014	Low (RCP2.6 scenario)	6.6–12.6	10.2–21.6
		High (RCP8.5 scenario)	8.7–15	17.7–32.3
Global	IPCC 2021	Low (SSP1-2.6)	-	12.6-24.4**
		Intermediate (SSP2-4.5)	-	17.3-29.9**
		Very High (SSP5-8.5)	-	24.8-39.8**
Global	NAS 2012	-	7–19	20–55
Puget Sound	Mote et al. 2008	Low	3.0	6.0
		Med	6.0	13.0
		High	22.0	50.0
Seattle	NAS 2012	-	6.5 ± 4.1	24.3 ± 11.5
Seattle	Mazotti et al. 2008	-	-	13.4–15.4 (RSL)
Olympia	City of Olympia 2010	-	-	50.0
Vancouver	BC Govt, (Bornhold, 2008)	High	-	35.0–40.5

*Above the 1990 level; relationship of SLR to sea temperatures applied to IPCC estimates.
**Above the 1995-2014 level.

Summary

Sea level rise estimates are highly variable and difficult to predict given the wide range of local and global factors involved, and the uncertainty surrounding those factors. The best available data with global and regional considerations are the most recent 2018 WCRN projections that are both localized to Washington State and incorporate estimates of local vertical land movement. In general, more recent publications are better, but global SLR is still uncertain. Global estimates offer a baseline, but "rates of sea-level rise calculated with climate and ice sheet models are generally lower than observed rates" (Rahmstorf, 2007). Due to this discrepancy, it is highly recommended for local jurisdictions to plan ahead for SLR with some flexibility and consider site-specific conditions in planning for increased flood risk.

Effects of Sea Level Rise

Frequency of Coastal Flooding

Current low-lying areas are subject to yearly flooding events, which are predicted to increase in both number and duration. In Port Townsend, for example, flooding of land begins at 11.5 FT MLLW a few times each year but is expected to increase to approximately 300 times (events) per year if sea level rises 3.3 feet (NOAA 2016). Current 100-year flood events could occur once every 10 years, and annual events could happen daily.

Habitat Response

Regional SLR in the Pacific Northwest is predicted to shift coastal habitats inland, potentially contributing to losses or creation of new habitat where land was previously dry year-round. In a 2007 study of Puget Sound, Glick et al. (2007) used the Sea Level Affecting Marshes Model (SLAMM) to estimate impacts to habitat and found that marshes near Anacortes (in Padilla Bay, Skagit Bay, and Port Susan Bay, including the eastern portion of Anacortes city limits) may lose up to 77% of brackish marsh and 91% of estuarine beaches by 2100. This is mostly due to a concept known as "The Coastal Squeeze", where intertidal habitats are trapped by bulkheads/seawalls or other features such as roads as they shift inland in response to SLR (Pontee, 2013). This could also potentially impact zoning codes as jurisdictional boundary lines shift and land cover adapts to an increased presence of water.

Landward migration of the shore was originally thought to be an equal give-and-take process, whereby a beach profile would maintain its original geometry as it shifted landward and upwards. This theory is known as the Bruun Rule. New knowledge on the behavior of beaches and bluffs experiencing SLR discredits parts of this theory, namely that such conditions do not exist in real life due to the complexities of the nearshore environment. The rule also assumes no accretion, but there are shorefaces that experience accretion under SLR conditions (Cooper and Pilkey, 2004). This adds further uncertainty when planning for the effects of SLR in frequently flooded areas but should be acknowledged in the code as a possible risk factor for new development in coastal floodplain areas.

The NOAA SLR viewer also has a Marsh Migration tool built in which spatially maps how habitat migration may occur based on topography and sea level rise magnitude. This tool maps land cover classes with 0.5 FT increments of SLR. The process to create the Marsh Migration dataset can be described generally as a modified bathtub inundation approach that attempts to account for local and regional tidal variability. Their methodology consisted of creating several tidal surfaces (MLLW, MTL,

MHHW, MHHWs, plus a surface above MHHWs) at each 0.5 FT increment, then combining those with the C-CAP landcover data to model the potential changes. The changes to the land cover are driven directly by those surface thresholds shown in Figure 7.

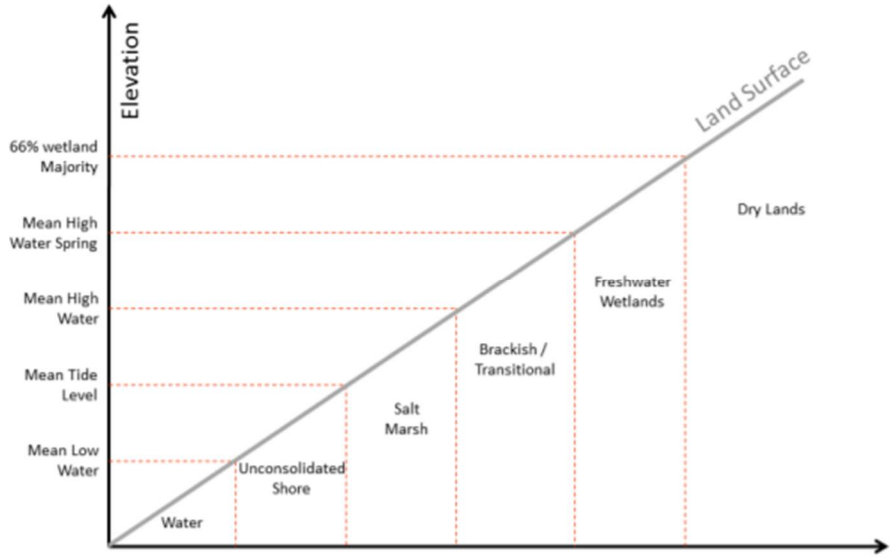


Figure 7. Wetland and landcover elevation thresholds used to model landcover migration with sea level rise in the NOAA Marsh Migration tool.

Comparing the modeled land cover class distribution for current conditions (at MHHW) to 1.5 FT sea level rise and 5.0 FT sea level rise (closest to predicted high emissions scenarios SLR), shows how the shoreline will lose habitat space to open water (Figures 8-10). There are some areas where habitats are modeled to expand with SLR, such as in the Ship Harbor area. These data support that based on the elevation of surrounding the shore, there is not abundant room for unconsolidated shores (beaches) to migrate landward with sea level rise.

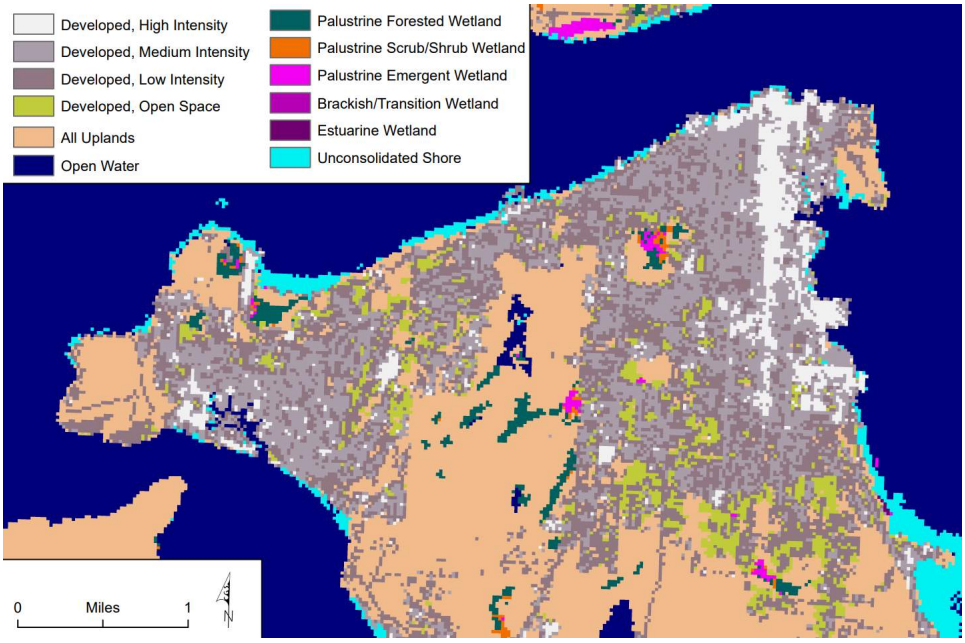


Figure 8. Marsh Migration landcover layer for mean higher high water scenario from NOAA's Marsh Migration tool.

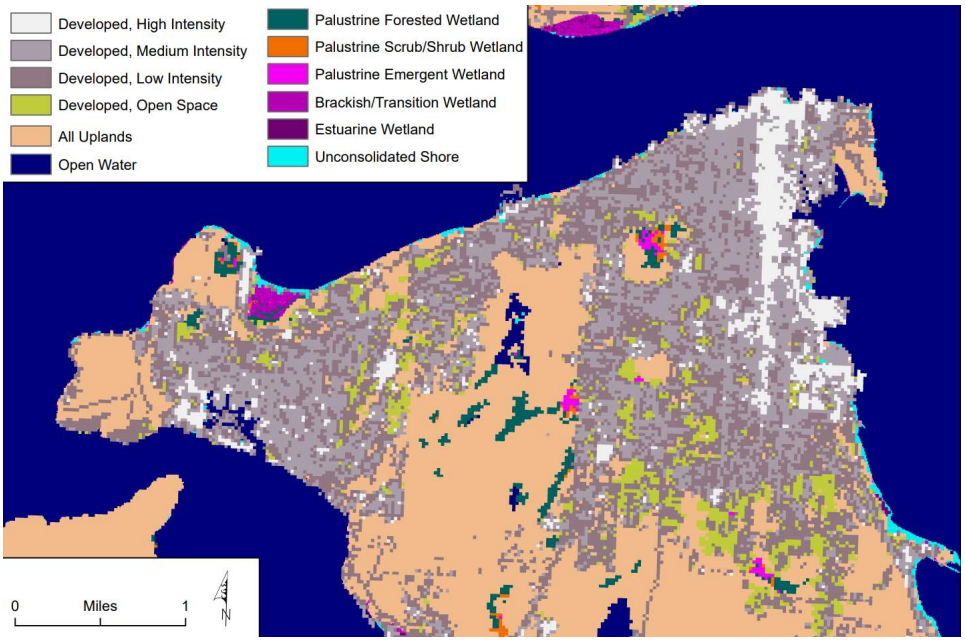


Figure 9. Marsh Migration landcover layer for MHHW plus 1.5 FT SLR scenario from NOAA's Marsh Migration tool.

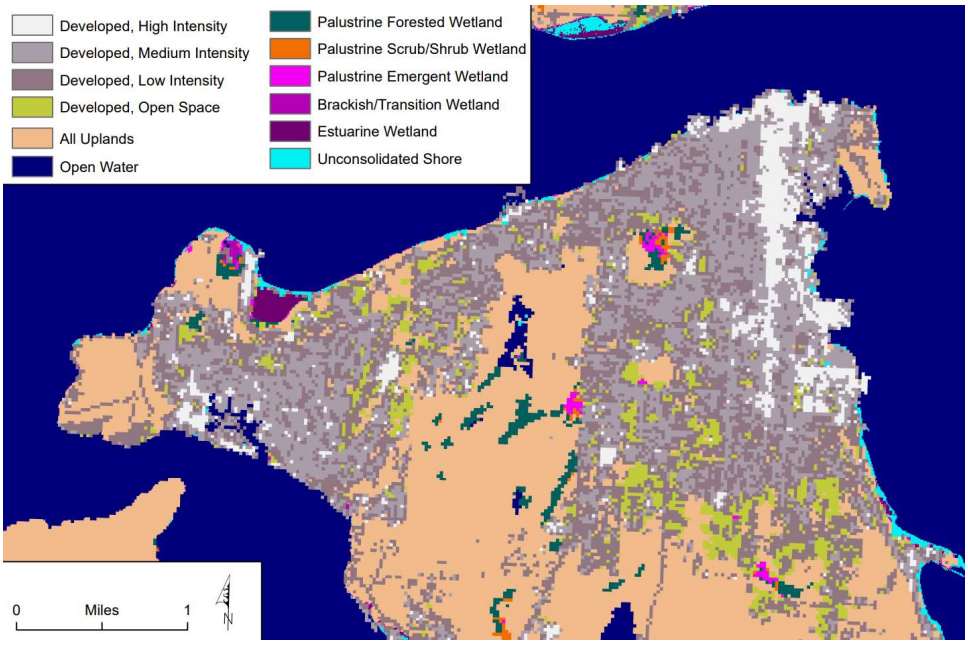


Figure 10. Marsh Migration landcover layer for MHHW plus 5.0 FT SLR scenario from NOAA's Marsh Migration tool.

Storminess

Locations along the Pacific Northwest Coast may be more likely to see extreme storm events exceed historical trends due predominantly to sea level rise (Tebaldi et al., 2012). A study by Ruggiero et al. (2010) supported that significant wave heights in the nearby Pacific Ocean had increased significantly in the latter part of the 20th century. However, there is currently not enough information to broadly predict an increase in extreme tides, surges, or flood risks in the Pacific Northwest or around the world (IPCC, 2014; National Research Council, 2012). Many nuances exist within Puget Sound that contribute to the difficulty of estimating the impacts of sea level rise on storms.

The 2021 IPCC Summary for Policy makers states "Region-specific changes include intensification of tropical cyclones and/or extratropical storms (medium confidence), increases in river floods (medium to high confidence), reductions in mean precipitation and increases in aridity (medium to high confidence), and increases in fire weather (medium to high confidence). There is low confidence in most regions in potential future changes in other CIDs, such as hail, ice storms, severe storms, dust storms, heavy snowfall, and landslides[2]" (IPCC et al., 2021b). While there is not high confidence in an increase in storminess for our region, defined by extratropical storms, the report makes it clear that "in coastal cities, the combination of more frequent extreme sea level events (due to sea level rise and storm surge) and extreme rainfall/river flow events will make flooding more probable (high confidence)."

Predicted Anacortes king tide events for the 2015/2016 winter season were around 9.1–9.2 FT above MLLW (NOAA 2016 tide publications). Actual peak king tide events are often higher than predicted due to low pressure storm systems. During the March 10, 2016, southerly windstorm and low pressure system, the peak water level at the Cherry Point NOAA station (nearest station) was 11.94 FT MLLW at 6:15am, while the predicted water level was 9.47 FT MLLW. Therefore, the tide that morning ran about

[2] The specific level of confidence or likelihood depends on the region considered. Details can be found in the Technical Summary and the underlying Report (IPCC et al., 2021b).

2.5 FT high and came close to a 10-year event for the Cherry Point Station (https://tidesandcurrents.noaa.gov/est/stickdiagram.shtml?stnid=9449424). The water level at the Port Townsend NOAA station was running 2.25 FT above predicted tide at the same time. On December 20, 2018 another storm event impacted the region. The peak water level at the Cherry Point NOAA station was 11.72 FT MLLW at 2:06pm, or 2.58 FT above the predicted tide. For the Cherry Point station, that is measured at between a 10-year and 50-year storm event.

Tsunamis

Sea level rise is not projected to change the size or prevalence of tsunamis, but will increase their base elevation and thus potential for flood damage. In general, tsunamis in Anacortes are not projected to be nearly as large as on coasts exposed directly to major fault zones such as the Pacific coast of Washington. Based on a Washington Department of Natural Resources 2005 report, Skyline Marina and Flounder Bay may experience inundation between 1.6 to 6.6 FT in the event of a large Cascadia subduction zone earthquake and corresponding tsunami (WDNR, 2005).. Tsunami wave amplitudes approaching western Fidalgo Island are estimated to be between 4.9 and 5.9 FT, but downtown Anacortes is not expected to experience much inundation (Venturato et al., 2004).

In 2018, NOAA's Center for Tsunami Research modeled tsunami generation and propagation and its impacts in the Anacortes region (Eungard et al., 2018). The study considered an extreme tsunami scenario generated by an L1 CSZ earthquake, which was estimated to have occurred in the top three CSZ earthquake events impacting the area in the last approximately 10,000 years, or a recurrence interval between 2,500 and 5,000 years. This is a similar probability of occurrence as the International Building Code seismic standard of 2 percent probability of exceedance in 50 years (Eungard et al., 2018).

Tsunami induced inundation was modeled (Figure 11) with the still water level set at the mean high water (MHW). Tidal variations and future sea level rise were not taken into consideration. Inundation depths were defined in three categories:

- 0 – 2.5 ft, less than knee high
- 2.5 – 6 ft, knee to head high
- > 6 ft, above head height

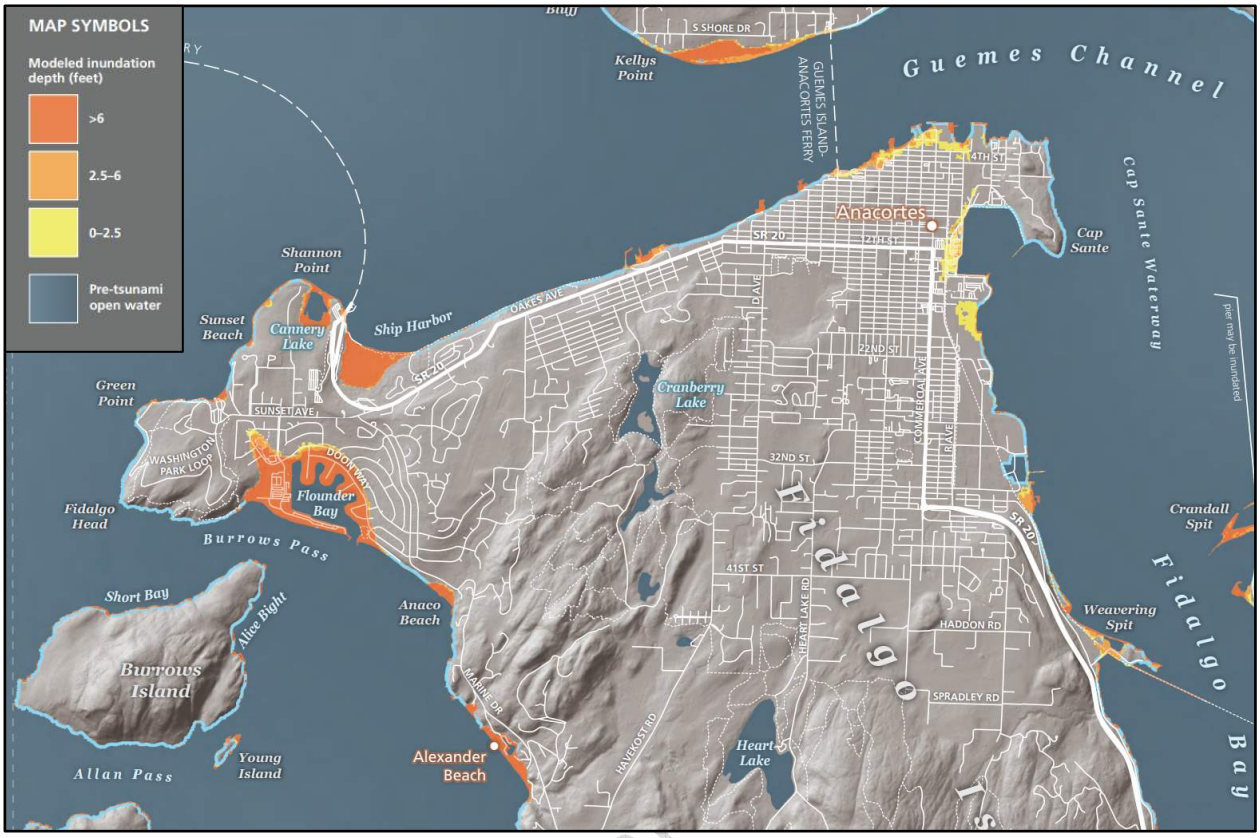


Figure 11. Tsunami inundation map for Anacortes area. Data from Eungard et al. (2018) for the CSZ L1 magnitude 9.0 earthquake scenario.

Along Anacortes shores, inundation of 1-2.5 FT is expected in the nearshore area of the downtown area, with some discrete areas of greater inundation depth (Figure 11). Larger areas with modeled inundation depths of greater than 6 FT include Ship Harbor, Shannon Point, and Flounder Bay. The DNR mapping also included tsunami current speed which was separated into four ranges (Eungard et al., 2018):

- 0 – 3 knots
- 3 – 6 knots
- 6 – 9 knots
- > 9 knots

Modeled current speeds with a large tsunami are strongest in narrower waterway channels such as Guemes Channel and Burrows Pass where local bathymetry and geometry may play a role. Within Fidalgo Bay, Burrows Bay, and Ship Harbor current speeds are relatively slow (>6 knots; Figure 12).

Tsunami waves approach the shore in the form of a series of pulsive surge waves. Arrival times were estimated from the time of earthquake to the first surge water front that rises above high tide. This first surge wave does not necessarily correlate with the maximum inundation. The initial disturbance along Fidalgo Bay was modeled as a gradual 5 to 6.5 FT fall in water levels approximately 1 hour to 1 hour and 45 minutes after the earthquake followed by a rapidly rising wave arriving after about 2 hours. Along

Fidalgo Bay, the second wave is expected to be the largest (Figure 13). The largest waves in the region are expected to see a peak surge height of 6.9 FT at the entrance to Fidalgo Bay.

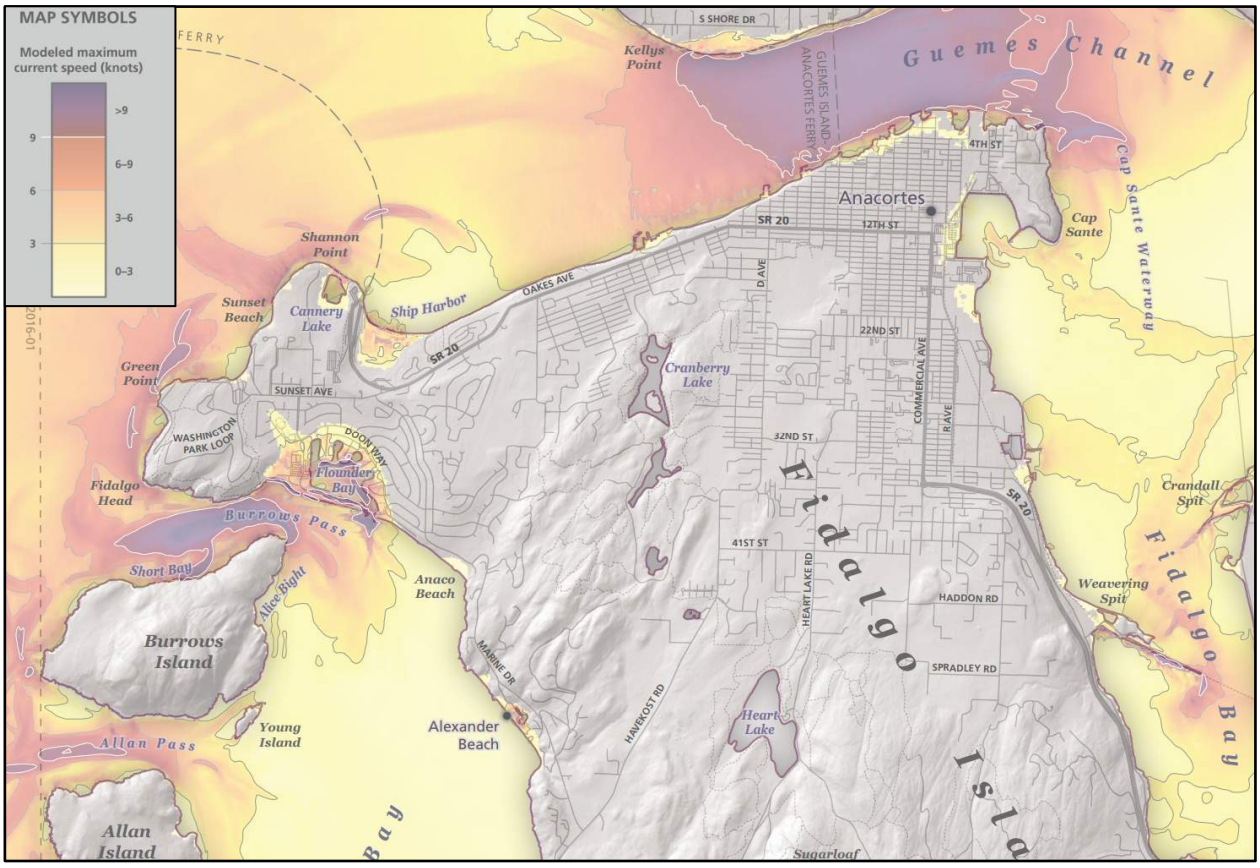


Figure 12. Tsunami current speed map for Anacortes area. Data from Eungard et al. (2018) for the CSZ L1 magnitude 9.0 earthquake scenario.

To put this into context, the 1964 magnitude 9.2 earthquake in Alaska produced a tsunami on the outer coast of Washington that lasted for about 12 hours (Walsh et al., 2000).

It is important to note that normal tides around Anacortes may rise and fall around 8 FT per day. Therefore, an incoming tsunami wave measuring 2.5–3 FT will not likely have a noticeable effect during normal conditions. Unless a tsunami coincides with an extreme high tide, such as a king tide, the inundation risk from a tsunami is relatively low and would be short-lived.

Modeling results outlined in Eungard et al. (2018) represent an approximately 2,500-year recurrence interval scenario or approximately the 2 percent probability of exceedance in 50 years. The exact earthquake scenario for the next large earthquake will likely differ causing the tsunami to differ as well. Studies have suggested that most likely the next earthquake will be about two-thirds the size of the L1 scenario creating a smaller tsunami than the modeled one (Witter et al., 2011).

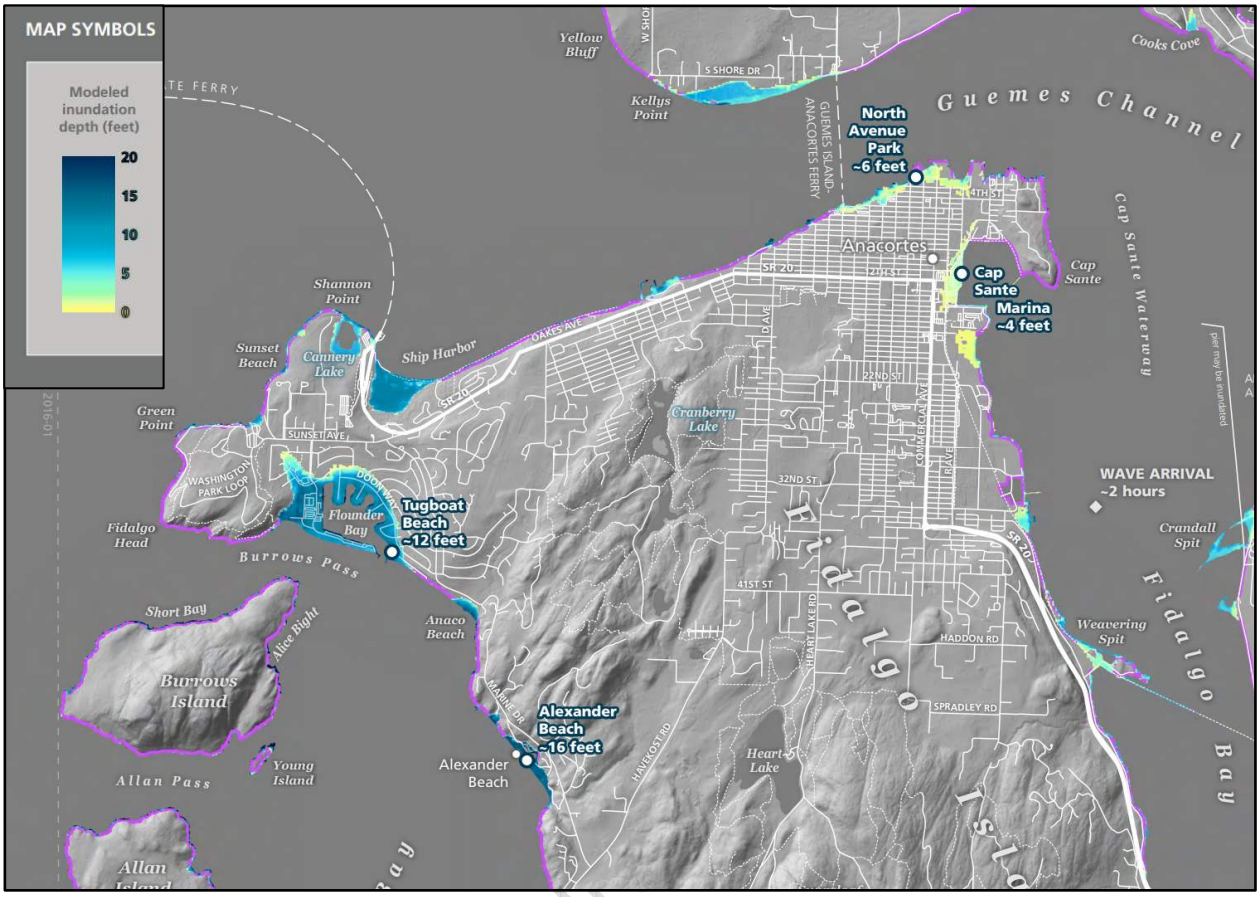


Figure 13. Tsunami inundation map of Anacortes with estimated arrival time and predicted inundation depth points. Data from Eungard et al. (2018) for the CSZ L1 magnitude 9.0 earthquake scenario. Purple line indicates where shoreline inundation is inferred but not quantified.

Higher water level than normal is expected to last for at least 8 hours (Figure 14) and minor inundation and strong currents may occur. However, even under these extreme circumstances only low-lying discrete locations will be inundated >6 FT above water levels. At inundation depths of 2.5 FT or less, survival is likely if steps are taken to avoid the direct force of a surge wave (Eungard et al., 2018). Current speeds of 3 knots or less are expected to cause no structural damage to hard outdoor structures, or paved features such as a trail. However, debris impact coming and going with the surge water may potentially result in certain structural damage and other property destruction at the immediate waterfront.

Additionally, with an approximately 2-hour lag time between the triggering CZA earthquake and tsunami inundation for the Anacortes Area, there would likely be sufficient warning for people to leave low-lying areas and move to higher ground or further inland.

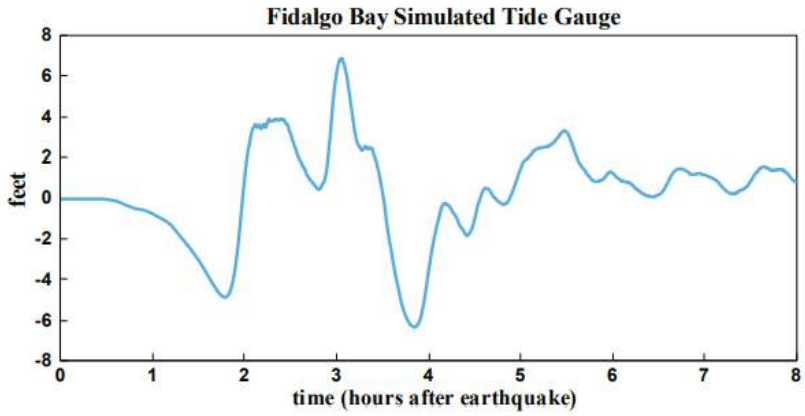


Figure 14. Modeled tsunami wave variations over time for the area near Fidalgo Bay. Data from Eungard et al. (2018) for the CSZ L1 magnitude 9.0 earthquake scenario.

Flood Risk Management

Development Standards

Current Anacortes CAO aims to reduce methods of flood losses by "controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters" and by "preventing or regulating the construction of flood barriers which will unnaturally divert floodwaters or may increase flood hazards in other areas" (19.74.010(A)(3)(C)(E)). Currently, new development in floodplains must obtain a special floodplain development permit and adhere to strict building regulations or obtain a variance. "Development" is currently defined as:

> "any human-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials located within the area of special flood hazard ." (19.74.020)

New construction within special flood hazards must adhere to standards described in the revised Chapter 19.74 Floodplain Management, which details provisions for flood hazard reduction (19.74.050) and relies on base flood elevation where available. The City should plan for higher-end projection(s) to set development standards against, as the base flood elevation is projected to change. All codified actions in the current Frequently Flooded Areas (FFA) are intended to be interpreted as "minimum requirements" (17.74.030(E)(1)), so this gives a well-positioned platform from which to build flexibility in SLR responses.

The City might consider establishing a setback from special flood hazard areas (SFHA) that reflects projected inland migration of the shoreline and disconnected low-land areas at risk of flooding. This reduces the need to erect flood protection barriers which may be costly and require maintenance, sometimes at the expense of the public. Setbacks are advised to also account for the accelerated erosion rates at beaches and bluffs in response to SLR (Shipman 2009; Johannessen and MacLennan, 2007).

Ecosystem and Floodplain Protection

"Flood risk management and ecosystem recovery are not mutually exclusive goals yet have been historically pursued independent of one another" (Puget Sound Partnership, 2012). Integrating and balancing these different goals is the key to smart and sustainable management of frequently flooded areas.

Anacortes does not have an extensive 100-year floodplain like Skagit Valley. However, it is still important to restrict new development in areas on or near the current 100-year floodplain (which is subject to move or expand due to SLR). Groundwater flooding will occur in areas but hard surfaces may increase pressure and cause damage to underground infrastructure. The inland lakes in Anacortes are expected to expand in a 100-year flood event, but base flood elevations are not known for these lakes (according to the FIRM mapping updated in September 2003).

The Skagit County Planning Commission and the Board of County Commissioners adopted proposed changes to their Critical Areas Ordinance and Flood Damage Prevention in 2011 (Ordinance #O20110008). The changes were suggested by the Biological Opinion, originally conducted by the National Marine Fisheries Service (NMFS) to require compliance with the Endangered Species Act when communities prepared for flood damage prevention. One important proposal was the expanded definition of "Development" (mentioned above) to include "removal of substantial amounts of vegetation, or alteration of natural site characteristics" (BiOp Checklist). By expanding this definition, more activities fall within floodplain development permit requirements, thereby further controlling floodplain development in order to preserve natural ecological functions. These revisions previously appeared in Title 14, chapters 24 (CAO) and 34 (Flood Damage Prevention) in the Skagit County Code, have been reviewed by FEMA and have been accepted.

New and substantial improvements to development within the floodplain currently require a special permit and may also require a habitat assessment (BiOp review 2011). Variances must demonstrate that ecological functions within the floodplain will not be impacted ("no net loss"). The FFA also recognizes that construction of flood barriers may exacerbate flooding and damage in other areas, potentially impacting homes as well as habitats for important fish and bird species.

Surf smelt, sand lance, and herring have documented spawning locations on several beaches in Anacortes, including the Washington Park boat launch, Ferry Beach, and the Anacortes Marina (http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/). It has been documented that these forage fish and juvenile salmon rely on gently sloped beaches and coastal marshes to provide nursery functions and protection from predators, but these important habitats are at risk of being eliminated due to the continued construction of hard armor in response to flooding and sea level rise (Munsch et al., 2016).

Shallow intertidal zones and other coastal habitats may act as protection against higher waters and wave action. Along with their ecological significance to forage fish and juvenile salmon, these areas can dissipate incoming wave energy and lessen damaging impact on the backshore (Cooper, 2003). Common strategies for managing high water and wave action are constructing bulkheads such as riprap revetments or rockery walls, but a heavily armored shore may require costly maintenance and can eliminate the natural buffer function of coastlines.

Critical Infrastructure

The City of Anacortes is listed as one of several especially vulnerable areas in Skagit County to tidal flooding and severe storm events due to its low elevation and northern aspect — severe storms and high tides occur together mostly during the winter months when strong winds from the north push water toward the coastlines of downtown Anacortes (Skagit County, 2014). The Port is of particular concern, located in a high risk, Flood Zone "A" area (i.e. area of special flood hazard), where portions of the filled shore may become inundated in a 100-year flood event (Coastal Zone Atlas flood maps).

Additionally, a few other critical sites are near or within the 2100 high emissions scenario SLR scenario, as modeled by MHHW plus the 20-year storms surge (2.9 FT) plus sea level rise (Figure 15). As mentioned earlier, the Anacortes Waste Water Treatment Plant is within the inundation level. Other facilities such as the two ferry terminals within the city, Skagit Valley College, and a public school are also potentially vulnerable to sea level rise.

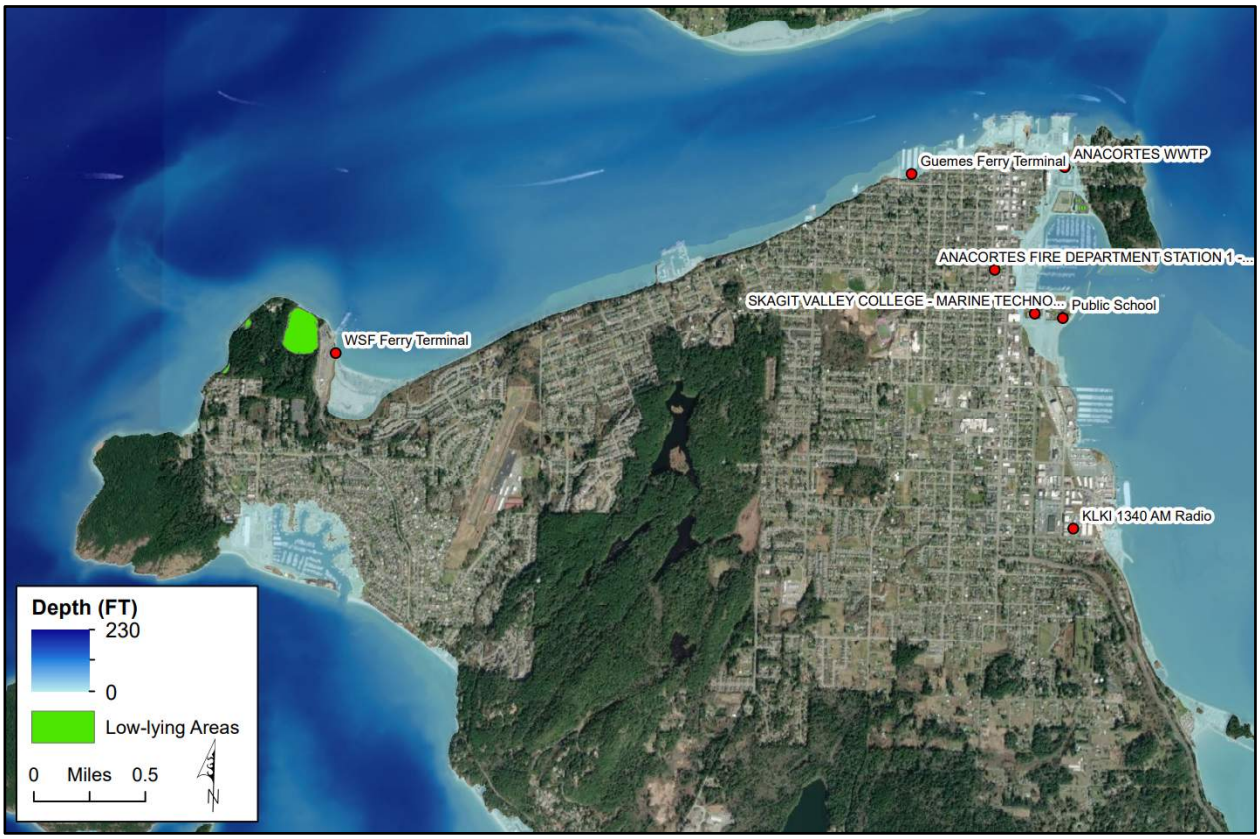


Figure 15. Critical infrastructure within or near the 2100 high emissions sea level rise scenario. Light blue areas would be inundated in this scenario, and the "low-lying area" is not mapped as connected to saltwater (due to the old railroad causeway at Ship Harbor). Data from HAZUS and WA Geospatial Open Data portal.

Managed Realignment

Managed realignment, or managed retreat, is becoming a preferred engineering approach to addressing SLR on the coast of England and elsewhere. Managed realignment is the process of "deliberately breaching, entirely removing, or relocating landward" existing coastal structures designed to defend against flood or erosion, however this definition does not adequately cover all aspects of the approach (Cooper, 2003). A good number of coastal roads have been relocated landward in the past 15 years in

north Puget Sound counties, such as Deer Harbor Road on Orcas Island, Lummi View Drive west of Bellingham, and Cook Avenue near Port Townsend. While managed realignment may be a viable option for mitigating SLR, the key element is inland space, and the shores of Anacortes are fairly heavily developed with limited room to easily retreat. This tactic may be considered by the City for planning over longer time horizons. Further feasibility research is needed before specific recommendations can be made.

Updated Mapping Techniques

FEMA flood mapping of Anacortes was last released in 2003, and features hand-drawn mapping techniques that do not take advantage of the computerization of mapping. Current efforts by FEMA to revise these maps are on indefinite hold due to difficulties or disagreements in mapping Skagit River levees (new FIRM maps will not have separate maps for cities). These updated maps are "nowhere near being ready" (David Radabaugh, NFIP State Coordinator, pers. comm.).

High-resolution aerial laser scanning (light detection and ranging; LiDAR) has recently become more affordable, and new LiDAR mapping would enable Anacortes to better prepare for coastal flooding.

LiDAR

According to Dalton et al. (2013), one of the main obstacles in assessing how communities will be impacted by climate change and SLR is "limited site-specific elevation data for quantifying the exposure of critical infrastructure to sea level rise and other hazards." Increased mapping accuracy of floodplain areas and sea level rise extent can inform stronger planning decisions and development standards. The most recent LiDAR survey was in 2017 and had a relatively high spatial resolution (3 FT). For the City of Anacortes, obtaining updated, high-resolution elevation data is essential in determining the risk of flooding. Small changes in sea level may not be reflected in coarser data but could have broad impacts in both coastal areas and inland lakes or where the water table is high.

LiDAR, with respect to older satellite- and ground-based mapping techniques, produces significantly less uncertainty and tighter representations of SLR inundation risk (see Figure 3 in: Gesch, 2009). Cooper et al. (2013) evaluate three methods of GIS-based LiDAR mapping for determining risk of flooding and inundation in coastal areas, and suggest best practices for sea level rise mapping. They argue that modeling must not assume areas in direct connection to marine waters are the only areas that will experience flooding in the event of high water. Because ground-water is disconnected, water seepage in low-lying areas may also lead to flooding.

Map Products

Currently, the Anacortes CAO aims to "ensure that potential buyers are notified that property is in an area of special flood hazard" (19.74.010(A)(2)(g))". One possible application of updated LiDAR mapping is to extend this provision to require potential landowners to be notified if they plan to build in a *future floodplain* that may occur as a result of the City's accepted SLR scenario. Where NFIP requires landowners to sign off on higher rates if they build in a flood zone, individuals could face an increase in rates if their property becomes subject to the special flood hazard area.

Potential Actions

As cities and counties prepare for the uncertain effects of sea level rise, it is important to consider both short-term and long-term scenarios. What may seem like unnecessary action now may become critical during this century: "Protecting against flooding and erosion [now] is considered economically rational for most developed coastlines in many countries under all . . . sea level rise scenarios analyzed" (IPCC 2014). We offer the following recommendations for potential action in terms of addressing the current CAO, analyzing and mapping effects of SLR, and integrating SLR planning into the CAO.

Developing a SLR Standard

- Choose a sea level rise projection that is appropriate for the City of Anacortes, considering all best available science and potential unknowns. Selecting projections for both 2050 and 2100 is recommended to develop shorter- and longer-term plans.
- Revisit SLR projections regularly (every 5 years is prudent) and revise them if necessary. Sea level is projected to rise at an increasing rate in this century.
- Reference all elevations to the North American Vertical Datum (NAVD) of 1988 for consistency with tide gauges and professional surveyors.

Addressing the Current CAO

- Increase the lowest floor level elevation from 1 foot to 3–4 feet above the base flood elevation for new development or improvements in current floodplains.
- Adapt the applications for a floodplain development permit to reference all structure elevations to projected mean sea level (using SLR estimates) instead of current mean sea level, or modify to reference the elevation of mean higher high water.
- Continue to inform permit applicants that their property is within the current floodplain, and if it is within the **future floodplain**.
- Enhance and/or promote the section of the FFA code titled "Coastal High Hazard Areas", as most floodplains in Anacortes are in direct contact with the coastline.
- Create language that differentiates cautious planning from legal minimums.
- Tsunamis are currently referenced in the Frequently Flooded Areas chapter and described in Geologically Hazardous Areas (19.70.415 (A)(6)). However, future code language could address the potential risk of a large Cascadia earthquake event that would likely be exacerbated by SLR. The Washington State Department of Natural Resources[3] and Washington Department of Ecology[4] have published online resources to help prepare for tsunami events.

Development Standards

- Protect public health and safety as well as public access and enjoyment of coastal flood zones: "Rising sea level does not inherently increase or decrease public access to the shore, but the response to sea level rise can" (US Climate Change Science Program Synthesis and Assessment Product 4.1, 2009).
- It is recommended to decrease the amount of hard, impervious surfaces near floodplain or risk areas, as these may intensify flood depths and velocities.

[3] https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis
[4] https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Hazards/Earthquakes-tsunamis

- Keep a detailed inventory of all houses on or near the current **and projected** 100-year floodplain.
- Flood insurance rates should reflect changing risks.
- Do encourage resilient building material and design while also considering softer techniques for flood control.
- The SMP includes a Public Access Element that requires the City to "provide, maintain, and enhance a safe, convenient, and balanced system of public access, both physical and visual." Anacortes should make every reasonable effort to ensure "physical and visual" access to shores within frequently flooded areas, but widespread construction of hard structures impedes public access and enjoyment, as well as the natural buffering function of coastal areas in response to floodwaters.

Ecosystem and Floodplain Protection

- As SLR alters coastal habitats, the City should consider impacts of flood prevention measures on forage fish and other environmental health indicators as well as, recognize that natural areas have as much value as built areas and should be considered at risk all the same.
- Where possible, add language within the FFA development code that supports more natural protection barriers including enhanced beach berms or vegetation enhancement, and prohibits unnaturally altering flood waters.

Managed Realignment

- It is recommended that the City of Anacortes investigate opportunities for managed realignment as a mitigation strategy. While the City may not immediately consider realignment, it should be considered in planning and engineering for SLR, and further research into local feasibility is needed.

Updated Mapping Techniques

- LiDAR data is a valuable tool for city planners investigating flooded areas and SLR effects, among other applications. Consider contracting or purchasing new LiDAR data with a 1.0-1.5 FT or less pixel size (high resolution).
- If LiDAR data is purchased, updated orthorectified aerial photography can be ordered at the same time from the same vendor. San Juan County recently purchased orthoimagery (3-inch resolution in built-up areas, and 9-inch countywide) with matching lower-resolution LiDAR.
- Apply the City's standard SLR projections to generate new maps of critical areas prone to flooding.
- Maps should highlight future floodplains.
- Identify low-lying areas with high fetch length (distance over water in which wind-generated waves can form) to the south and southeast as areas subject to potential wave hazards. Known problem areas such as Croatian Way can help determine thresholds for objective criteria.
- Make new maps available to the public and other City departments and development groups, including those addressing risk to utilities and other critical infrastructure.

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Notice of Public Hearing & SEPA DNS

Including written comment period, public hearing date, and environmental review.

Publish Date:	July 28, 2021
Proposal Name:	Floodplain Management Regulations Update
Documents Available at:	https://www.anacorteswa.gov/161/Planning-Community-Economic-Development
Lead Agency:	City of Anacortes Planning, Community & Economic Development Department
Contact Person	Don Measamer, Director
Public Hearing Body:	Anacortes Planning Commission
Public Hearing Date:	Wednesday, August 25, 2021, at 6:00 PM

Proposal Description

The proposal includes amendments to the City's Floodplain Management Regulations to improve consistency with Federal Emergency Management Agency (FEMA) and National Floodplain Insurance Program (NFIP) guidelines, and to relocate the Chapter to Anacortes Municipal Code Title 19. Changes are proposed to revise existing and add new definitions; fix code cross-references; add variance review criteria and update residential and nonresidential structure construction standards.

The draft interim ordinance is available for review at:
https://www.anacorteswa.gov/161/Planning-Community-Economic-Development

SEPA Threshold Determination

The City of Anacortes has determined that this proposal does not have a probable significant adverse impact on the environment. An environmental impact statement is not required under the State Environmental Policy Act, RCW 43.21C.030(2)(c). This determination was made after review of a completed environmental checklist and other information on file and available upon request.

This determination is issued pursuant to WAC 197-11-340(2). The City of Anacortes will not act on this proposal for 14 calendar days from the date of issuance. Comments and/or appeals regarding the DNS must be submitted to the contact below no later than August 11, 2021, at 5:00 PM.

How to Comment

Comments are accepted via email, paper, or verbally. Written comments regarding the draft regulations will be accepted up until 3:00 PM on August 25, 2021, and must include (1) your full name, (2) your mailing address, and (3) the proposal name ("Floodplain Management Regulations Update").

Email comments are preferred and must be sent to don@cityofanacortes.org. Please include your comments in the body of your email message rather than as attachments.

Paper comments may be mailed or delivered to:

City of Anacortes
Planning, Community & Economic Development Department
ATTN: Don Measamer
P.O. Box 547 / 904 6th St.
Anacortes, WA 98221

Verbal comments may be made at the Public Hearing. The public hearing will be held in-person at City Hall (904 6th St., Anacortes, WA) and virtually. Virtual meeting access information can be found on the Planning Commission agenda, posted Thursday prior to the meeting here:
https://www.anacorteswa.gov/700/Meeting-Documents-and-Video