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DEPARTMENT OF ECOLOGY State of Washington

OFFICE OF CHEHALIS BASIN

Be Aware, Be Prepared

Protect Yourself from Flooding in the Chehalis Basin

Prepared by
Office of Chehalis Basin
Washington Department of Ecology
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ACRONYMS AND ABBREVIATIONS

BFE	Base Flood Elevation
CFAR	Community Flood Assistance and Resilience program
CRS	Community Rating System
FIRM	Flood Insurance Rate Map
NAVD	North American Vertical Datum
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
SFHA	Special Flood Hazard Area

1 INTRODUCTION

The three most important things you can do about flooding are:

1. Know when a flood is coming
2. Protect your property
3. Carry flood insurance

The Office of Chehalis Basin recommends that you do all three in order to reduce damage from flooding. All three are introduced and summarized in this guide. There are links to websites that can help you and a list of more detailed references on the last page. You can also get help through the Community Flood Assistance and Resilience program, or CFAR.

1.1 Community Flood Assistance and Resilience Program

The Community Flood Assistance and Resilience program (CFAR) is a new program managed by the Washington Department of Ecology, Office of Chehalis Basin. CFAR provides both technical assistance and funding to help Chehalis Basin tribes, local governments, residents, and businesses take actions that will reduce the threat to life and property damage from flooding and erosion.

If you would like to request initial technical assistance, need help developing a project, or have general questions about flood issues, please contact Chrissy Bailey at the Office of Chehalis Basin (360) 407-6781 or chrissy.bailey@ecy.wa.gov.

While it is up to you to decide what is best for your situation, CFAR can help you learn about and weigh your options.

In addition to technical assistance, CFAR can provide funding support for some building protection measures. The first step in seeking financial help is to have a CFAR advisor review your situation with you and show you the financial assistance application procedures.

More information on CFAR can be found at https://chehalisbasinstrategy.com/cfar/.

1.2 Technical Terms

Several sections of this guide use terms that should be defined. They are from the **National Flood Insurance Program** (**NFIP**), which provides government-backed insurance for flood damage in cities and counties that agree to regulate new development in the floodplain. The agreement is that the federal government will make flood insurance available if the local government makes sure that new buildings and other development meet certain minimum flood protection standards. All of the cities and the three primary counties in the Chehalis Basin (Lewis, Thurston, and Grays Harbor counties) are in the NFIP.

You can find the Flood Insurance Rate Map and information from it at your local building department or at the Federal Emergency Management Agency (FEMA) Map Service Center https://msc.fema.gov/portal/home. Just enter an address.

The NFIP publishes **Flood Insurance Rate Maps** or **FIRMs**. They delineate the **Special Flood Hazard Area** (**SFHA**) where local governments must regulate and they provide flood insurance rate setting information. The SFHA is the area where the ground is lower than the base flood elevation.

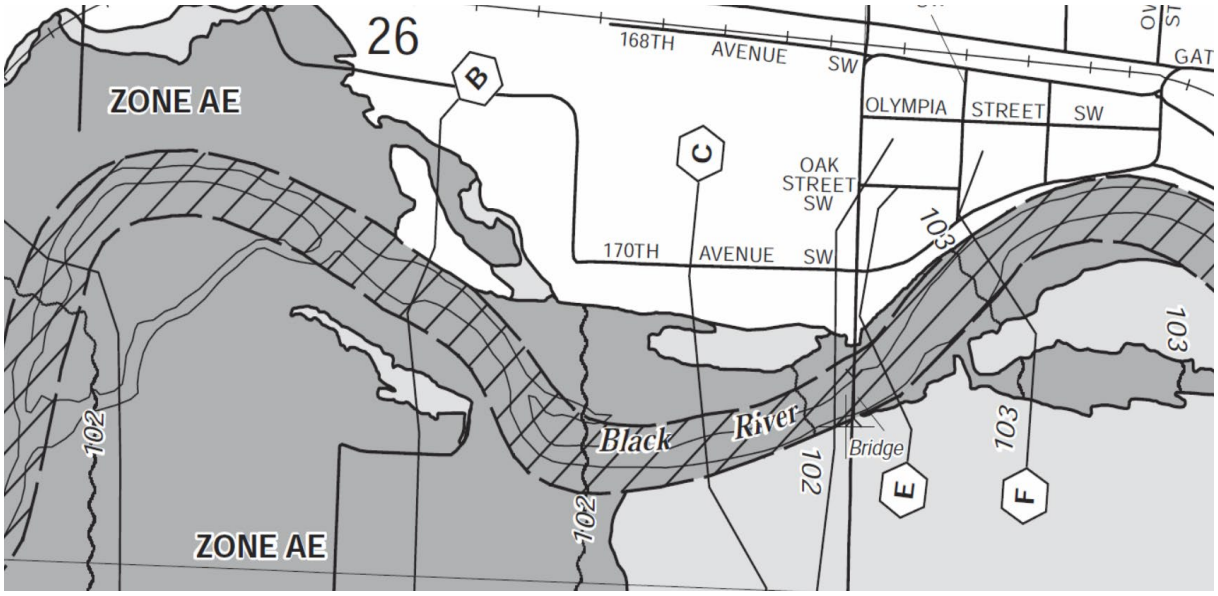
The **base flood elevation** or **BFE** is the elevation above sea level of the base flood. The base flood is the flood that has a 1% or 1 out of 100 chance of occurring in any year. It is also called the 100-year flood, but that term is not used much anymore because people thought that meant it only happens once every hundred years. In fact, at the Grand Mound gage on the Chehalis River, the floods of 1990, 1996, and 2007 were as high or higher than the BFE shown on the FIRM for Thurston County.

The **flood protection level** is the level you want to protect your property to. For flood insurance purposes, the living area within your home should be at least as high as the BFE. It may be a higher elevation if required by local codes.

The flood protection level may also be the level of the highest flood experienced at the site, especially if that is higher than the BFE. This flood is known as the "flood of record."

Another feature shown on the FIRM is the **floodway**. This is the central part of the SFHA, closest to the channel. It is usually the most dangerous part of the floodplain because the water is deeper and moves faster. There are special federal and state regulatory requirements in the floodway (see 3.B on page 12).

EXCERPT FROM A FLOOD INSURANCE RATE MAP



This excerpt from the Thurston County Flood Insurance Rate Map shows the Special Flood Hazard Area (the dark shaded "Zone AE"), the floodway (the "/////" area along the channel), and base flood elevations (102 and 103 feet above sea level (NAVD; see page 7).

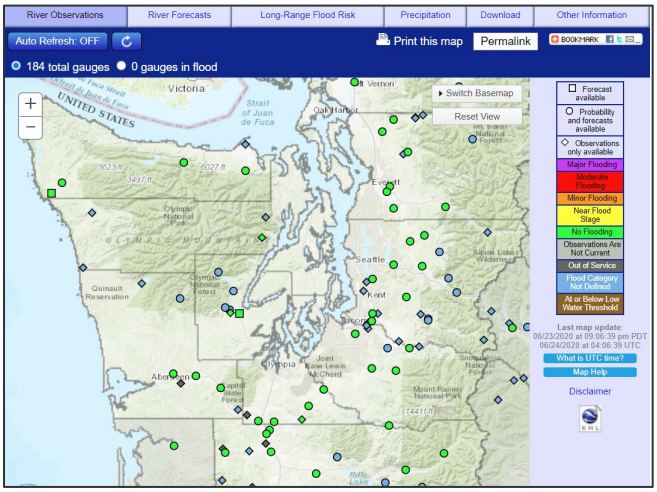
2 FLOOD WARNING

Knowing that a flood is coming can be very valuable to protect your family and your property. Knowing how high the water could get can be even more useful. Over the last 10 years, the Chehalis River Basin Flood Authority has added rain and river gages and taken other steps to improve the quality and utility of flood warning information throughout the Basin.

Find your gage: You can access this information by going on the National Weather Service's Advanced Hydrologic Prediction Service website, https://water.weather.gov/ahps/.

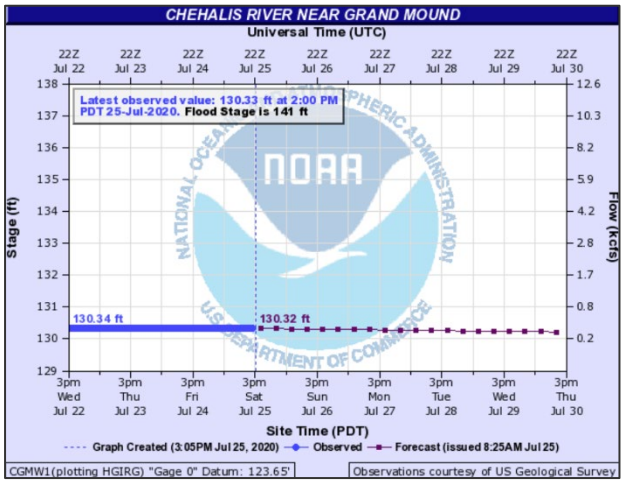
Use the  tool in the top left corner to zoom in on your area of interest. A green dot is a gage that reports both current water level and predicted future levels. Pick one or more gages closest to your location by clicking on the green dot(s). You will get a hydrograph like the one on page 7 that shows recent gage readings in blue and the predicted gage readings in red.

National Weather Service
Advanced Hydrologic Prediction Service

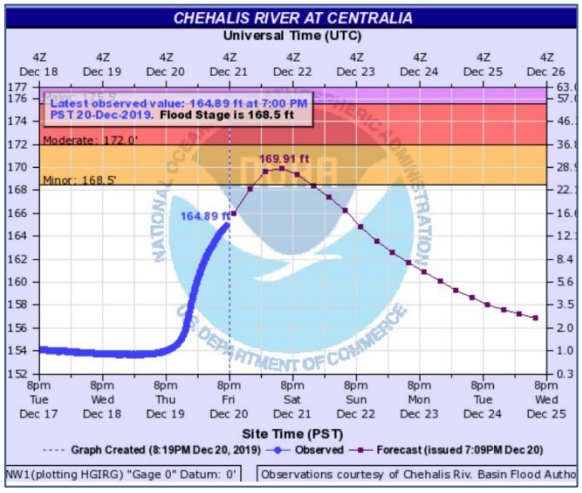


River gages report heights in "stage," as noted on the left side of the hydrographs on page 7. In the example on the left, the Chehalis River at Grand Mound is at a stage of 130.34 and is predicted to stay at that level for the next few days. This is well below the "Flood Stage" at this gage. Generally "flood stage" is the level where water starts causing damage to human development like roads and buildings.

Chehalis River Gages at Grand Mound and Centralia



This is the Grand Mound gage reading on July 25, 2020. The river level was predicted to stay steady. This gage is discussed more on the next page.



This is the Chehalis River gage at Centralia on December 20, 2019, when a flood was predicted to reach an elevation of 169.91 feet, above this gage's "Flood Stage" of 168.5.

Historically, "stage" for most gages was a level above an arbitrary starting point. The Flood Categories information to the right was taken from the Grand Mound gage. Note that in 1996, the flood crested at 19.98 and in 2007 it crested at 147.26. The 2007 flood wasn't 127 feet deeper. The newer records are recorded in relation to mean sea level. There are two different "sea levels." The older system is used in the Lewis County FIRM, known as National Geodetic Vertical Datum (NGVD). The newer system, the North American Vertical Datum (NAVD), is used in the FIRMs for Grays Harbor and Thurston counties and most of the river gages' more recent readings.

The Grand Mound gage's Historic Crests includes the Dec. 4, 2007, flood in both the old stage (20.23) and NAVD (147.26). The difference is 147.26 – 20.23 = 127.03. You can add this difference to the stage values to convert the older readings to NAVD.

For example, the Feb. 9, 1996, flood crest was at a stage of 19.98, which is 19.98 + 127.03 = 147.01 feet above sea level (NAVD). In other words, the 1996 flood was only 0.25 feet below the crest of the 2007 flood at Grand Mound. This approach is the only way to compare stage readings to the flood elevations on the FIRM. See also www.chehalisriverflood.com and the Gage Height Conversion Project.

Flood Categories (in feet)

Major Flood Stage:	144
Moderate Flood Stage:	142.5
Flood Stage:	141

Historic Crests
(1) 147.26 ft on 12/04/2007
(2) 142.68 ft on 12/22/2019 **(P)**
(3) 142.41 ft on 01/08/2020 **(P)**
(4) 20.23 ft on 12/04/2007
(5) 19.98 ft on 02/09/1996
Show More Historic Crests

(P): Preliminary values subject to further review.

Recent Crests
(1) 142.41 ft on 01/08/2020 **(P)**
(2) 142.68 ft on 12/22/2019 **(P)**
(3) 15.77 ft on 02/10/2017 **(P)**
(4) 14.47 ft on 11/26/2016 **(P)**
(5) 16.84 ft on 12/10/2015 **(P)**
Show More Recent Crests

(P): Preliminary values subject to further review.

Most gage websites have additional information on what happens at and above flood stage. Here's an excerpt from the National Oceanic and Atmospheric Administration (NOAA) website for the Chehalis River at Grand Mound, where flood stage is 141 feet:

146 The Chehalis River in Thurston County will cause severe near record flooding, with deep and swift flood waters inundating the Independence Valley. Flooding will occur all along the river including headwaters, tributaries, and other streams within and near the Chehalis River Basin.

144.5 The Chehalis River in Thurston County will cause major flooding, inundating roads and farm lands in Independence Valley. Deep and swift flood waters will cover SR-12 and James, Independence and Moon Roads. Flooding will occur all along the river including headwaters, tributaries, and other streams within and near the Chehalis River Basin.

142.5 The Chehalis River in Thurston County will flood several roads in Independence Valley with swiftly moving water including SR-12 and James, Independence, Moon and Anderson Roads. Flood waters will cut off access to and from Chehalis Reservation and inundate nearby farm lands. Some residential structures may be threatened.

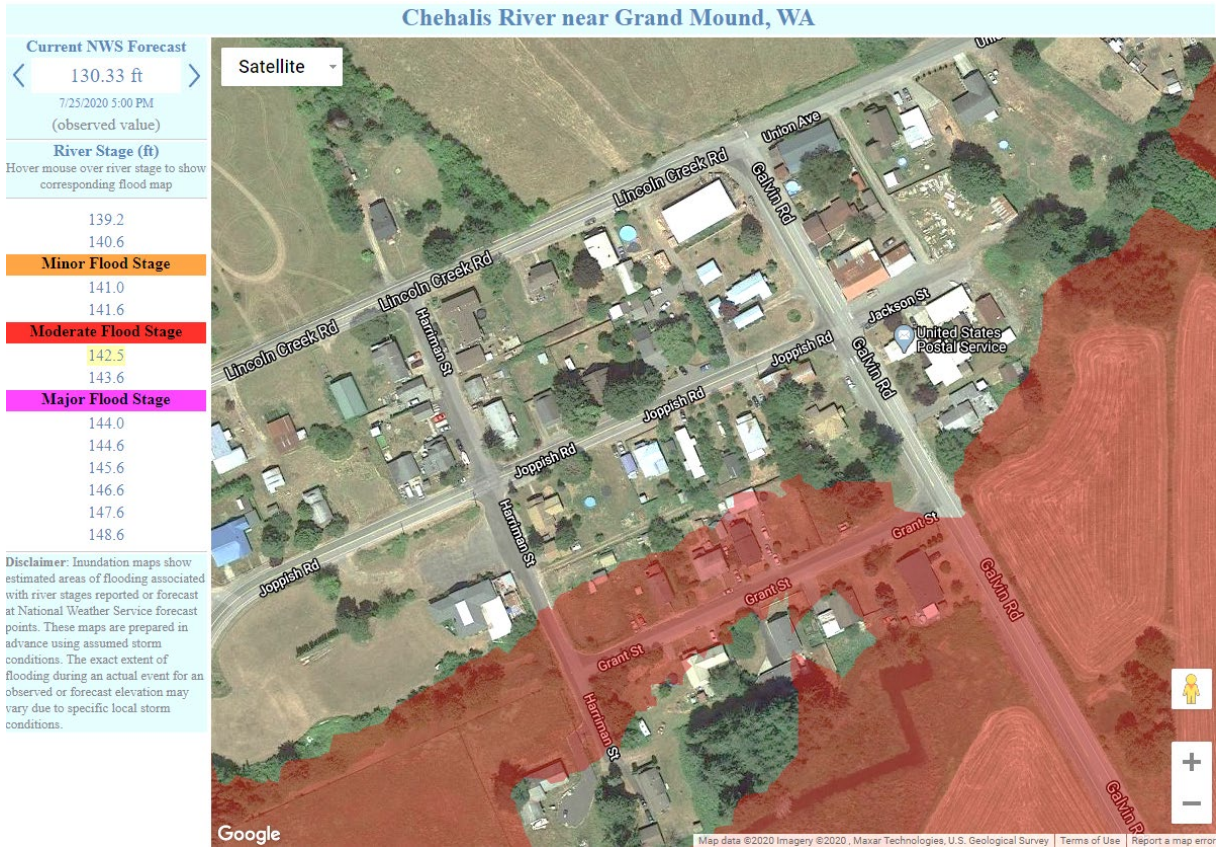
141 The Chehalis River in Thurston County will flood several roads in Independence Valley including James Road, Independence Road, and Moon road. Flood waters will also cover nearby farm lands. – https://water.weather.gov/ahps2/hydrograph.php?wfo=sew&gage=cgmw1

Relate flood stages to your situation: For example, at the Grand Mound gage the Jan. 8, 2020, and Dec. 22, 2019, river crests were about a foot-and-a-half above the flood stage of 141 feet. A good way to remember how high those floods were on your property is to mark them. By doing so, you can relate the gage data to your situation. In this example, if the January 2020 flood at 142.41 was a foot below your garage floor, you know that a prediction of a river level of 143.4 feet or higher at the same gage means water will probably get into your garage. The closer your property is to the gage, the more accurate this comparison.

The Weather Service gage data and a helpful additional tool can be found on the Chehalis River Basin Flood Authority's Flood Warning System website, www.chehalisriverflood.com. Scroll down and click on "Flood Maps." Pick a gage near your location (example to the right). You will get a map like the one shown on the next page.

Find your location on the map. The unincorporated community of Galvin in Lewis County is shown in the example below, about 2 miles upstream of the Chehalis River gage at Grand Mound. You can pick any of the stages shown on the left side of the screen, e.g., a recent flood or a predicted flood level.

Example Flood Stage Forecast Map



The above example shows the area predicted to be flooded when the Grand Mound gage reads 142.5 feet. This level is close to the 2019 and 2020 historic crests noted on page 8.

When there is a flood warning, you can also click on the "angle brackets" surrounding the "Current National Weather Service Forecast" ("<" and ">" right or left of "130.33 ft" in the example above). This allows you to scroll through the entire Weather Service forecast and see the inundated area expand and contract as the flood passes through the site. Times for each level of flooding are noted as well.

Please note the following:

1. Consider how well these maps match your experience of a recent flood. If you remember the flood covering a larger area, keep that in mind when you look at a map of a predicted flood level.
2. You may be subject to flooding from more than one source. The flood shown on the previous page is backwater from the Chehalis River, but this area could also be flooded by Lincoln Creek

or a combination of both. This could result in a flood higher than predicted on the Chehalis River gage.

3. No prediction is 100% accurate and no map is perfect. If you get a warning for one level, you may want to map the next higher level to provide a margin of safety.
4. Check when your property and your building would be flooded, but also be aware of other impacts in your area, especially when roads and bridges will go under water. It would not be unusual for your evacuation route to be blocked before the water reaches your house. In the example on the previous page, most of the buildings are still dry at 141.5 feet, but a map of a larger area (right) shows that all roads going in or out of Galvin (yellow square) will be under water.

Get a warning: You can sign up for a notice from your county emergency management office. Getting a notice is particularly helpful because you'll be advised of potential flooding, even if you're asleep or out of town. The notices may come by email or to your smartphone. Here are the counties' sites, where you can go to sign up for alerts and notices:

- Thurston County: https://www.thurstoncountywa.gov/em/Pages/ei-alert.aspx
- Lewis County: https://flood.lewiscountywa.gov/during-flood/monitor-situation/
- Grays Harbor County: http://www.co.grays-harbor.wa.us/departments/emergency_management/preparedness.php

Once you know your gage, understand the readings, and can relate the readings to your situation, you can convert a general flood warning to something much more specific for your property. You can check the gage and map whenever you want, when it's raining, or when you get an alert. You can also see live webcam views of current river levels at several locations at https://chehalis.onerain.com/dashboard/list/.

Have a response plan: Responding to a flood can be intense. It's a good idea to decide with your family or housemates who is doing what, and write it down so nothing is forgotten. Such a plan can be used for other hazards, like a fire. It should include turning off utilities, packing important papers (especially your insurance policies), caring for your pets, and moving valuables upstairs or to high ground. Check the county websites for links to emergency preparedness and emergency grab-and-go kits.

Note: Even if your building won't be damaged, you should still evacuate a flood-prone area before the flood. You may need to be able to get to a hospital or help family when the water is up.

3 PROPERTY PROTECTION MEASURES

This section reviews what you can do to your property or building to reduce the likelihood of damage by a flood. Six different measures are introduced. Each works better in different situations. This section starts with a review of the factors that determine which measure works best for your situation.

3.1 Factors that Affect the Choice of a Measure

Before you can decide how to protect your property, you need information on four factors.

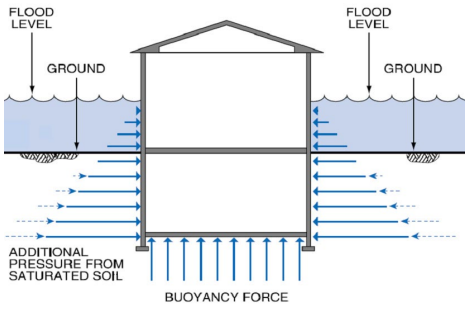
1. **The flood hazard.** You have more options if the floodwaters are shallow and slow moving. Here is some flood information you need:

    A. **Flood velocity:** Faster moving water is more dangerous and puts more pressure on a structure. What was the experience during past floods? You can get the average calculated velocities from the Flood Insurance Study for your county, which can be found on FEMA's Map Service Center (see box, page 4). This information is only available where a floodway was mapped, which is usually only for larger rivers. A velocity greater than 3 feet per second is considered too dangerous to walk or drive in.

    B. **Flood depth:** You can use the gage stage information explained on pages 6 and 7 and recent flood depths to determine how deep the water will be, and how that might affect the level at which you want to protect your property.

    C. **Warning time:** You need time to evacuate and you may need some time to install part of your protection measures, such as closing an opening in a floodwall. You can have more lead time if you receive alerts and check your gage predictions, as explained in the Flood Warning section. Or, you may want to design your measure so it does not require any last-minute installations.

Hydrostatic Pressure on Building Structure



As water gets deeper, hydrostatic pressure increases. Deeper flood depths can crack or break a building's walls and floor. See also the photo of the block wall, page 16.

2. **The building.** Is the building in good condition? If there are structural problems, it may be cheaper to demolish the building and rebuild to code rather than repair and retrofit it. Another factor is the type of construction. It is very difficult to keep water out of a basement or area below ground level (see graphic above). A building on a crawlspace is easiest to elevate while one on a slab is easier to dry floodproof. In either case, it makes a difference if the structure is masonry, brick faced, or has wooden or vinyl siding. These factors are further explained for each measure.

3. **Construction requirements.** Every community in the Basin has regulations on buildings and development. There are two special requirements for buildings in the SFHA.

    A. If an existing building in the SFHA is "substantially improved," the NFIP regulations require that it be treated as a new building. The NFIP minimum regulations define "substantial improvement" as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement." This requirement also applies to buildings that are substantially damaged (i.e., the cost to repair exceeds 50% of the market value).

    A substantially improved or substantially damaged residence in the SFHA must be elevated above the base flood elevation. Most of the communities in the Basin require elevating to one or more feet above the base flood elevation. A non-residential building must be elevated or dry floodproofed. The building could be demolished or replaced with a new code-compliant structure, but the other measures described in this section are not permitted.

    B. If a substantially improved or substantially damaged residence is in the mapped floodway, state law may not allow it to stay or be replaced in the floodway. There are some very specific exceptions to this, so be sure to check with the building official in your community to see what the minimum requirements are for your situation.

4. **Cost.** The fourth factor is the price. The perfect measure may not be affordable or may not be worth the cost. There are federal and state funding programs for the more expensive measures, acquisition, and elevation. They usually require the benefiting property owner to pay a share of the cost.

    CFAR may fund some of the measures described in this section, in addition to acquisition and elevation. However, if there are more applications than funding available, it may take a year or more to get the funds. It will also take some paperwork and a review of the project to ensure it meets funding criteria. For some of the least expensive measures, such as protecting utilities or regrading a yard, it may be more efficient for the owner to pay the full cost rather than wait for financial assistance.

3.2 Acquisition

A property with structures subject to flooding may be purchased by a government agency, land trust, or similar organization, and cleared. The land may be kept by the purchasing entity, usually for recreation or open space use. While this is usually considered the ultimate solution for a floodprone building, there can be some downsides to property acquisition:

- The local government loses part of its tax base.

- The government may not have lower public costs for the area. If some properties remain, the local government still has to maintain streets and utilities in the area (see photo below).
- Neighborhoods may be broken up and residents may leave the area, especially if there is no affordable replacement housing nearby.

Where acquisition works best: All floodprone areas. Other measures often are not as effective in areas subject to deep, fast-moving, or repetitive flooding where risk to people and properties may be greatest.

Appropriate building types: While all types of buildings can be acquired and cleared, the following buildings are most appropriate to clear:

- Buildings in a floodway or shoreline buffer area, where new buildings and major improvements over time may be restricted by floodway and shoreline management program rules.
- Vacant buildings and/or buildings in poor condition that may cost more to fix than they are worth.
- Where the owner is interested in selling for whatever reason.

Area of a Volunteer Acquisition Project

The vacant lots along a river in this aerial photo were acquired as part of a flood mitigation project. Those who did not volunteer to sell remain, leaving the "checkerboard" pattern.
Google Earth

Flood insurance premium reduction: N/A. There is no building left to insure.

Experience in the Basin: Several cities and counties have acquired and cleared floodprone properties, primarily with FEMA funding assistance.

If a building is still in good condition, an option that can be considered is to sell the building back to the owner at a very small cost. The owner would have to move the structure to a location that does not flood. This saves the government agency the cost of demolition and allows the owner to keep his or her home.

3.3 Elevation

When elevating a structure, all damage-prone parts of the building are raised above the flood protection level on a foundation intended to resist flood damage. Elevation is typically less expensive and less disruptive than acquisition, but the residents are still exposed to the flood hazard.

The elevation process requires adequate clearance around the building to insert beams under it. This is relatively simple for a building with the lowest floor already partially elevated, such as with a crawlspace

foundation. It can be much more expensive for a slab-on-grade foundation and for a building with several wings or masonry walls.

Once the beams are in place, the structure is slowly jacked up. Sometimes utility lines are extended during the process in order to allow the owner to stay in the building. When the lowest floor is above the desired height, a new foundation is built and the structure is lowered down onto it.

The lower areas must be open or wet floodproofed. Only parking, access, and limited storage is allowed. If the project is funded by a grant, a non-conversion agreement is required in order to dissuade future owners from improving or modifying the lower area in a way that makes it susceptible to flood damage.

Where elevation works best: Areas with lower velocity flooding and depths less than 8 feet.

Appropriate building types:

- Structures in sound condition.
- Buildings on crawlspaces and other elevated foundations are the easiest to elevate.

Before, During, and After Elevating a House

Flood insurance premium reduction: Flood insurance premiums can be significantly lowered if the building is elevated to or above the base flood elevation.

Examples of Elevated Buildings

Buildings can be elevated to the flood protection level (left) or to a higher level to give the owner a full story for parking or storage (right). The lower area cannot be improved in a way that is susceptible to water damage. Both of these buildings are on the Chehalis River in Thurston County. The one on the left was elevated with government funding support. The one on the right was funded by the owner.

Experience in the Basin: Numerous homes have been elevated, most with FEMA mitigation grants. Two Thurston County elevation projects are shown above.

In 2008, FEMA published *Evaluating Losses Avoided Through Hazard Mitigation, City of Centralia, Washington*. This special FEMA study looked at 35 homes that had been elevated after the 1996 flood. The report concluded:

> Had these 35 homes not been elevated, the December 2007 flood would have caused between $6,574 and $186,122 in flood losses for each home. For just these 35 elevated homes, the total losses avoided from the December 2007 flood are estimated to be $1,905,760.
>
> The cost-effectiveness of these Centralia elevation projects was clearly established for a single flood event. It can be expected that the payoff from mitigation expenditures will continue to increase over the effective life of the structures, as avoided cumulative losses grow with subsequent flood events.

Flood openings: One problem with several elevated homes in the Basin has been inadequate flood openings in the foundation walls, as illustrated on the next page. In 2016, the Chehalis River Basin Flood Authority initiated a special program in the Town of Bucoda to fund retrofitting homes on elevated foundations to provide the proper flood openings (see page 25). This modification can greatly reduce the cost of flood insurance.

The Need for Proper Flood Openings

This is an example of an improperly elevated building. The openings are too high to relieve hydrostatic pressure.

This is an example of a properly elevated house. Note the location of the openings, near the ground.

This is what happens to a block wall when the openings do not meet code and hydrostatic pressure is not equalized.

This building in Bucoda was retrofitted with flood vents near the ground that automatically open to let water in.

3.4 Barriers

Barriers divert shallow floodwaters away from a structure. Typical barriers are walls, berms, and regrading a yard. If flood warning time allows (which is possible because of the Basin's flood warning program on the larger rivers, like the Chehalis and Skookumchuck), sandbagging or emergency walls could be erected. Barriers have the advantage of being less expensive and less disruptive than acquisition and elevation.

Where barriers work best:

- Relatively shallow flooding, e.g., less than 2 feet deep. Deeper flooding requires an engineered floodwall that can be expensive to build and maintain.
- Most barriers have openings, such as driveways and doors. There must be enough flood warning time to allow someone to close these. On the main stems of the larger rivers, the Chehalis River Basin Flood Warning System should provide adequate lead time, provided a responsible person is close enough to respond.

Appropriate building types:

- Barriers make more economic sense for buildings that are on slab foundations where it is not cost-effective to elevate them.
- Larger parcels that have enough room for a barrier without affecting drainage on neighboring properties (see example, next page).
- Areas where the soils are relatively impervious. Otherwise, if floodwaters stay up for several hours, water seeps under or through the barrier.

Flood insurance premium reduction: No

Experience in the Basin: See the examples below.

Examples of Successful Floodwalls

The owner of this house in Centralia (above) built the floodwall around his house after his first flood. It has worked during subsequent floods (the home is slated for clearance by the Port Authority). The commercial building (right), also in Centralia, but outside the Special Flood Hazard Area, combined the concrete barrier with landscaping to reduce its visual impact.

Example of Engineered Barrier

This engineered barrier protects Pe Ell's wastewater treatment plant. It was built with funding support from the Flood Authority.

3.5 Dry Floodproofing

Dry floodproofing means making the walls of a building watertight and closing all openings, so water that gets to the building does not get inside. The building itself becomes the barrier to the passage of floodwaters. Dry floodproofing can be done anywhere except for new, substantially improved, or substantially damaged residential buildings in the SFHA.

Where dry floodproofing works best:

- Shallow flooding, less than 2 feet deep. Most buildings were not designed to withstand the hydrostatic pressure that deeper floodwaters put on walls.
- Most dry floodproofing projects have openings, such as doors. There must be enough flood warning time to allow someone to close these. On the larger rivers, the Chehalis River Basin Flood Warning System should provide adequate lead time, provided a responsible person is close enough to respond.

Example of Dry Floodproofing



This house was dry floodproofed by the owner with a concrete apron around the slab, a low wall at the doorway, and a removable closure that requires an hour of warning time. The measure has worked for local drainage flooding since it was built in the 1960s. It was overtopped when a nearby levee failed during a higher flood.

Appropriate building types: Buildings on a slab-on-grade foundation with masonry or brick facing. These buildings are easier to make watertight and they are expensive to elevate. Buildings on crawlspaces should not be dry floodproofed.

It should be noted that a number of dry floodproofed commercial buildings failed during Hurricane Sandy in New Jersey in 2012. It was found that parts were missing or had not been maintained and that building owners were not familiar with how the measure operated. Long-term maintenance and practice drills are vital for dry floodproofing to be effective.

Flood insurance premium reduction: Only for non-residential buildings that are floodproofed to 1 foot above the base flood elevation.

3.6 Wet Floodproofing

Wet floodproofing allows water to enter a floodable area, such as a crawlspace, but damageable items are removed or elevated and the finishings, contents, and use of the interior are modified so damage is prevented or minimized. Materials in the lower area are waterproofed or elevated above the flood protection level.

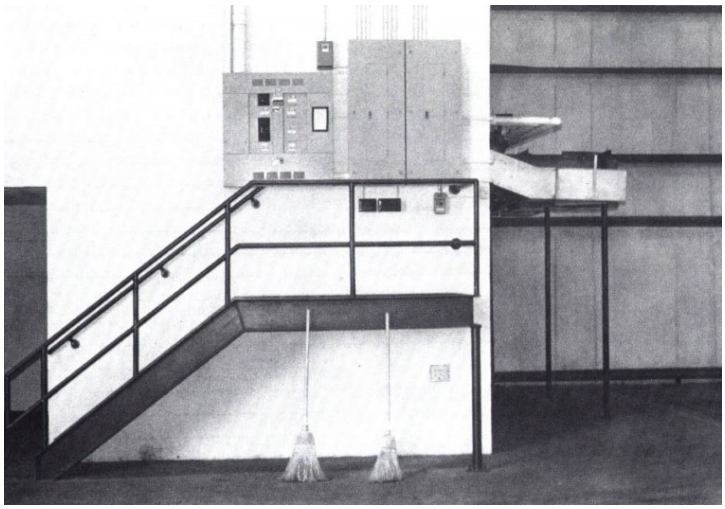
Wet floodproofing projects are generally inexpensive and many can be undertaken by the owner. Most wet floodproofing projects do not affect the exterior appearance of the building.

Where wet floodproofing works best: Slow-moving floodwaters.

Appropriate building types: Crawlspaces, garages, or other parts of a structurally sound building below the first floor.

Examples of Wet Floodproofing

The washer, dryer, and water heater were elevated in this wet floodproofed garage.



Large commercial, industrial, and storage buildings are easier to adapt to wet floodproofing than small or residential buildings.

Flood insurance premium reduction: Premiums may be reduced where a lower area, such as a crawlspace, is wet floodproofed. This may make a higher floor level become the lowest floor for insurance rating purposes. This is illustrated on page 25. A project such as the one illustrated on page 22 could also result in lower premiums.

Experience in the Basin: It is possible that some properties outside of the Bucoda examples on page 25 have been wet floodproofed by the owners, but because the measure is not visible from outside, there are no documented cases.

3.7 Utility Protection

If utilities are protected, not only is flood damage reduced, but the time it takes to clean and reoccupy a flooded building is also reduced. All or parts of a building's utility systems can be protected, even if the rest of the building cannot. This is usually done by elevating the furnace, air conditioner, appliances, and/or the electrical and plumbing systems above the flood level.

Electrical systems below the flood protection level should be on separate ground fault interruption circuits. Plumbing systems are generally watertight unless there is a fixture below the flood protection level.

These projects are usually affordable and are often funded by the owner. One of the best times to elevate above flood levels is when an appliance is being replaced (see example, right).

Where utility protection works best: Slow-moving floodwaters.

Examples of Utility Protection

This house has an elevated air conditioning compressor and electric meter.

The owner replaced a flood damaged water heater with a shorter one and elevated it.

Appropriate building types: Some utility protection can be provided in all types of buildings.

Flood insurance premium reduction: There may be a reduction if all "machinery or equipment servicing the building" is above the base flood elevation.

Experience in the Basin: There are outdoor air conditioning units that have been elevated, as in the examples on the next page. It is possible that more projects have been implemented, but they are not visible from outside.

Example of HVAC Protection

After a flood destroyed the HVAC utilities in this house's crawlspace, the owner elevated the air conditioning compressor and relocated the furnace and ductwork into the attic. This project also resulted in a wet floodproofed crawlspace.

4 FLOOD INSURANCE

Flood insurance is highly recommended, especially if you don't construct a property protection measure. If you do build or install a protection measure, insurance is still recommended in case the flood exceeds your project's flood protection level.

An advantage of insurance is that your property is covered as long as the policy is in force, even when you're not home to implement your flood response plan. Most standard homeowner's insurance policies do not cover a property for flood damage. For flood coverage, you will need either a policy under the NFIP or one underwritten by a private company. Both types of policies are sold by local licensed insurance agents.

Many of the flood insurance policies in the Chehalis Basin are NFIP policies. The criteria are consistent, so this section only discusses National Flood insurance. All the cities and counties in the Chehalis Basin participate in the NFIP, so any building in the Basin (whether it is in or outside of the SFHA) can be covered by an NFIP flood insurance policy.

Any property insurance agent can sell an NFIP policy and all agents must charge the same rates. Your rates will not change just because you file a claim for damage; they are set on a national basis. If your agent does not know about flood insurance or you don't have an agent, see "Buying a Policy" in FEMA's FloodSmart website menu – https://www.floodsmart.gov.

What's covered: Any walled and roofed structure can be covered by an NFIP policy. Detached garages and accessory buildings are covered under the policy for the lot's main building. There are two types of coverage: structure and contents. A structural policy generally covers everything that stays with a house when it is sold, including the furnace, cabinets, built-in appliances, and wall-to-wall carpeting.

Contents coverage can be purchased with a structural policy or separately. Renters may purchase contents coverage, even if the owner does not have structural coverage. Contents move with the owner when the building is sold, but do not include certain items like money and valuable papers. There is no coverage for things outside the building, like a driveway or landscaping.

The NFIP considers any floor below ground level ("grade") as a basement. For example, the lower level of a split level house and a crawlspace with its floor below ground level are considered basements. A NFIP policy does not cover damage to contents in a basement. Structural coverage only covers the structural parts of a basement's walls and floor (not finishings like wallpaper or paneling) and selected items such as the furnace, water heater, washer, and sump pump. The NFIP does not insure buildings for subsurface flooding, including seepage and sewer backup.

Mandatory purchase: If you are located in an SFHA, you must buy flood insurance coverage as a condition of having a federally backed mortgage, home improvement loan, or disaster assistance. In other words, if the federal government is insuring a bank and that bank makes loans secured by a floodprone building, federal law requires a flood insurance policy on the building (but usually not on the contents).

Waiting period: There is a 30-day waiting period before NFIP flood coverage takes effect. Don't wait for the next flood to buy insurance protection.

Cost of a policy: Buildings constructed before their community's first Flood Insurance Rate Map are called "pre-FIRM" buildings. Most of the FIRMs in the Chehalis Basin were first published between 1977 and 1986. You can find your community's "Initial FIRM Identified" date at www.fema.gov/cis/WA.html. The flood insurance premium for a pre-FIRM building is usually a flat rate subsidized by the National Flood Insurance Program.

The premium for a post-FIRM building is based on the elevation of the lowest floor compared to the base flood elevation, as illustrated in the table below. If a pre-FIRM building is elevated high enough, it can take advantage of a lower "elevation rated" premium.

The cost of a flood insurance policy has been going up since passage of a federal law in 2012 that requires a phasing out of any federal subsidy. In addition to the construction date, the premiums depend on a variety of factors, such as amount of coverage, whether the property is in the SFHA, and the amount of the deductible. The most expensive premiums are for unprotected post-FIRM buildings in the SFHA—they can run up to $10,000 a year or more.

The rates are the same everywhere with one exception: rates are lower in the communities that participate in the NFIP's Community Rating System (CRS). In the four communities within the Chehalis Basin that participate in CRS, the premiums for properties in the SFHA are reduced by the percentage shown: Centralia (20%), Chehalis (15%), unincorporated areas of Thurston County (40%), and unincorporated areas of Lewis County (25%).

The best way to lower the cost of an NFIP policy is to show that the structure is protected to the base flood elevation or higher. This is most commonly done by getting the building out of the SFHA or elevating it above the base flood elevation.

The example to the right shows how the cost of a flood insurance policy goes down as the building gets higher in relation to the base flood elevation. These figures are for a one-story single family home on a crawlspace, in the SFHA, with $100,000 in building coverage and a $1,000 deductible (April 2020 Flood Insurance Manual).

NFIP Insurance Premiums

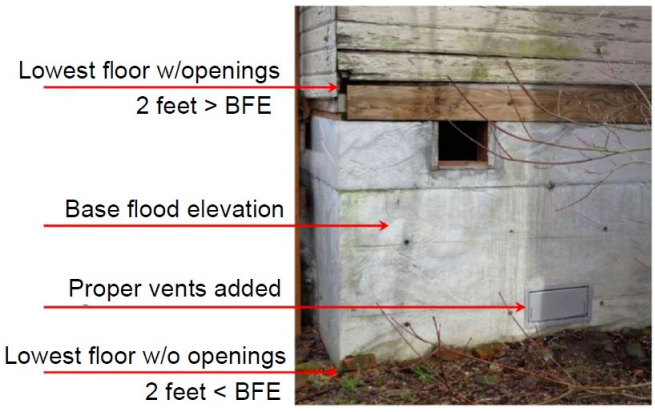
Height above/ below BFE	Annual Premium
3 feet > BFE	$368
2 feet > BFE	$490
1 foot > BFE	$830
At BFE	$1,722
1 foot < BFE	$4,056
2 feet < BFE	$6,029
3 feet < BFE	$7,620

Some other property protection measures may also help, as in the projects the Flood Authority conducted in Bucoda (see below). Contact CFAR (see page 4) for technical and financial assistance on ways to protect your building and lower your premiums.

How can I pay less for flood insurance? For answers to this question, visit www.floodsmart.gov/flood-insurance-cost/savings

Case Study: Lowering Flood Insurance Premiums in Bucoda

The key factor in rating a building in the SFHA for flood insurance is the elevation of the lowest floor in relation to the base flood elevation. In the example to the right, the original building only had air vents at the top of the foundation wall, just below the floor joists. The NFIP requires a certain number of flood openings within 1 foot of ground level in order for the lower area to be considered a crawlspace. Without these openings, the hydrostatic pressure could collapse the walls (see the graphic on page 11 and the photo on page 16).



Prior to the installation of proper vents, the flood insurance premium for the building in this example was based on the lowest floor being 2 feet below (<) the base flood elevation. The premium for $100,000 in structural coverage for such a building would cost over $6,000. It is high because the building is considered at a great risk of damage.

The Chehalis River Basin Flood Authority funded retrofits to several homes in Bucoda. The proper size and location of flood openings were installed. Afterwards, the building in this example would be rated as being 2 feet above (>) the base flood elevation. The premium would be less than $500 for the amount of coverage in the NFIP Insurance Premiums table on the previous page.

5 REFERENCES

The following references provide more detailed information on the six property protection measures. They can be downloaded at no cost at https://chehalisbasinstrategy.com/cfar/protect-yourself-from-flooding/. Some are also available in the Timberland Regional Library.

Above the Flood: Elevating Your Floodprone House, FEMA 347, 2000.

Community Rating System brochure, FEMA B-573, 2018.

Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures, FEMA 259, 2012.

Evaluating Losses Avoided Through Hazard Mitigation, City of Centralia, Washington, FEMA, 2008.

Floodproofing Non-Residential Buildings, FEMA P-936 / July 2013.

Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home From Flooding, FEMA P-312, 2014.

Requirements for Flood Openings in Foundation Walls and Walls of Enclosures, FEMA TB 1, March 2020.

Protecting Building Utility Systems From Flood Damage, FEMA P-348, February 2017.

Protecting Manufactured Homes from Floods and Other Hazards, A Multi-Hazard Foundation and Installation Guide, FEMA P-85, November 2009.

Protecting Your Home And Property From Flood Damage – Mitigation Ideas For Reducing Flood Loss, FEMA P-805, 2010.

Property protection measures references

Reference	Acquisition	Elevation	Barriers	Dry Floodproofing	Wet Floodproofing	Utility Protection
Above the Flood		✓				
Engineering Principles and Practices		✓	✓	✓	✓	✓
Floodproofing Non-Residential Buildings				✓	✓	✓
Homeowner's Guide to Retrofitting		✓	✓	✓	✓	✓
Openings in Foundation Walls		✓			✓	
Protecting Building Utility Systems		✓			✓	✓
Protecting Manufactured Homes		✓				
Protecting Your Home and Property		✓	✓		✓	✓