

4.7 Local-scale Flood Damage Reduction Actions

Local-scale Flood Damage Reduction Actions include Floodproofing (and buy-outs of flood-prone properties), Local Projects (including protection of roads and infrastructure and local-scale floodplain reconnection projects), Land Use Management improvements within the Chehalis River floodplain, and Flood Warning System Improvements (see Section 2.3.3.2). Temporary ground-disturbing construction activities are limited to Floodproofing and Local Projects. The primary benefit of the Local-scale Flood Damage Reduction Actions is the reduction of flood damage to residential, commercial, industrial, public, and agricultural properties. The Local-scale Flood Damage Reduction Actions also have fewer significant adverse impacts on many elements of the natural and built environment than the Large-scale Flood Damage Reduction Actions.

For short- and long-term impacts, this section focuses on those actions that would result in adverse impacts or beneficial effects. Where no effect on an element of the environment is anticipated to result from Local-scale Flood Damage Reduction Actions, impacts are not discussed in this EIS. Short-term construction activities for Floodproofing and Local Projects could involve excavating, clearing, filling, dewatering, concrete use, in-water work, and equipment use and staging. Some of the current Local Projects (see Section 2.3.3.2) are studies and do not involve construction; because these are in the planning and preliminary feasibility phases, potential impacts are not evaluated in this EIS. Implementation of Floodproofing and Local Projects would primarily result in beneficial effects due to reduction of flood damage to structures, infrastructure and roads, and agricultural uses (including protection of livestock and farm equipment). Land Use Management actions could reduce the potential for future development within the Chehalis River floodplain. Flood Warning System Improvements would result in increased accuracy with regard to forecasting flood timing and extents, and increased public safety. Because flood warning systems are not structural, effects to the natural elements of the environment are not expected.

4.7.1 Water Resources

4.7.1.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on water resources related to Floodproofing and Local Projects are described in Table 4.1-1. Although temporary, these actions would increase the potential for sedimentation and turbidity in surface waters, risk of contamination to surface and groundwater, and interruptions to surface water quantity and groundwater (e.g., recharge and discharge and localized hyporheic exchange alterations) in areas of temporary dewatering or water diversions.

4.7.1.2 Long-term Impacts

4.7.1.2.1 Surface Water Quality

Floodproofing

Floodproofing structures within the Chehalis River floodplain would result in beneficial effects on water quality. Pollution levels in nearby waterbodies could be reduced by avoiding inundation of structures and their contents, and the corresponding exposure of floodwaters to contaminants related to residential or commercial use, such as waste, chemicals, solvents, and hazardous or toxic materials during floods.

Local Projects

Implementation of Local Projects that include bank stabilization has the potential to benefit water quality as compared to the baseline, because projects designed to protect eroding banks at specific locations would ensure WWTPs are not compromised during floods. However, Local Projects including bank stabilization are also likely to result in a loss of riparian structure where actions are implemented, which could lead to increased solar radiation and heating of surface water, resulting in a minor adverse impact.

Land Use Management

Land Use Management actions may have the potential to improve water quality during and after floods by restricting further development within the Chehalis River floodplain, thereby reducing future potential sources of pollution at risk of exposure to floodwaters and preserving natural floodplain functions that have the potential to benefit water quality. As noted in the *Build Out Analysis* (see Appendix L), Land Use Management recommendations designed to minimize creating future parcels in the Chehalis River floodplain may not be effective at limiting development due to the abundance of developable parcels that currently exist. Therefore, Land Use Management regulations that prohibit or restrict specific uses, such as restricting new on-site sewage systems, are likely to be more effective at reducing the future potential for adverse water quality impacts than those designed to limit the creation of new parcels in the floodplain.

4.7.1.2.2 Surface Water Quantity

Floodproofing

Floodproofing actions would include installation of raised fill pads for livestock and equipment, and may include small-scale walls or berms to protect residential or commercial structures. These farm pads or walls could deflect floodwaters and increase water velocities and flood depths adjacent to and slightly upstream and downstream of the project location. This is considered a minor adverse impact on water quantity due to the relatively small size, localized nature, and limited extent of these projects Basin-wide. When elevating homes, raising residential structures would generally occur in the same footprint and, therefore, would not result in an increase in flood velocities or depths in adjacent areas.

Local Projects

Some of the Local Projects are proposed to protect properties and roads from floodwaters using bank stabilization measures, which would deflect floodwaters and increase water velocities and flood depths adjacent to and slightly upstream and downstream of the project. This is considered a minor adverse impact on water quantity due to the localized nature and extent. Bank stabilization projects could deflect the river's energy downstream and increase erosion in downstream reaches. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit surface water quantity by slowing and storing flows during floods.

Land Use Management

Changes in Land Use Management include open space preservation and restrictions on floodplain filling, which could be a beneficial effect to water quantity because it would limit future uses and activities in the floodplain that increase flood elevations upstream and downstream. Restricting further floodplain fill and maintaining open spaces would prevent downstream rises in flood levels when compared to the baseline. However as noted in the *Build Out Analysis* (see Appendix L), Land Use Management recommendations designed to minimize creating future parcels in the Chehalis River floodplain may not be effective at limiting development due to the abundance of developable parcels that currently exist. Therefore, Land Use Management regulations that prohibit or restrict specific uses, such as fill in the floodplain, are likely to more effectively minimize future water quantity impacts from continued development in the floodplain.

No adverse impacts on water use and water rights are anticipated with Local-scale Flood Damage Reduction Actions because these actions would not affect the ability of area water users to divert their water rights.

4.7.1.2.3 Groundwater

Floodproofing

Floodproofing actions may include small-scale walls or berms to protect residential, commercial, industrial, or agricultural structures. Subsurface excavation for the installation of these types of floodproofing measures has the potential to modify shallow groundwater regimes and, as a result, could have a minor adverse impact on groundwater quantity, depending on the location.

Local Projects

Subsurface excavation for the installation of bank stabilization measures associated with Local Projects has the potential to modify shallow groundwater regimes, including potential effects to hyporheic exchange. As a result of these actions, minor adverse impacts on groundwater quantity could occur due to their localized extent. Floodplain restoration projects could reconnect surface waters to groundwater and result in a benefit to groundwater quantity. No adverse impacts on groundwater quality are anticipated with Local Projects.

Land Use Management

Changes in Land Use Management include open space preservation and subdivision set asides, which could have a beneficial effect on groundwater by maintaining infiltration capacity of soils in areas within the floodplain where groundwater recharge occurs.

4.7.1.3 Mitigation

Potential mitigation measures for short-term impacts on water resources are described in Table 4.1-1. Potential mitigation measures for long-term impacts on water resources are described in this section.

4.7.1.3.1 Surface Water Quality

Floodproofing

No adverse impacts on surface water quality are anticipated related to Floodproofing, so no mitigation is proposed.

Local Projects

Potential mitigation measures for adverse impacts on surface water quality related to Local Projects could include replanting riparian areas with multi-storied vegetation to mitigate for a loss of riparian structure that provides shade and filters runoff.

Land Use Management

No adverse impacts on surface water quality are anticipated related to Land Use Management, so no mitigation is proposed.

4.7.1.3.2 Surface Water Quantity

Local Projects

Potential mitigation measures for long-term adverse impacts on surface water quantity related to Local Projects could include compensatory storage in the areas where flooding would increase as a result of any fill placed. Compensatory mitigation for bank stabilization and infrastructure protection projects would depend on site-specific conditions, but avoidance and minimization measures could include minimizing the length of stabilization to the extent necessary to protect the structure or use that is at risk, and utilizing soft shoreline stabilization approaches to the extent feasible.

Land Use Management

No long-term adverse impacts on surface water quantity are anticipated, so no mitigation is proposed.

4.7.1.3.3 Groundwater

Floodproofing and Local Projects

Mitigation for site-specific, localized effects to groundwater from Floodproofing and Local Projects would depend on the project and site conditions.

Land Use Management

No long-term adverse impacts on groundwater quality or quantity are anticipated, so no mitigation is proposed.

4.7.2 Geology and Geomorphology

4.7.2.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on geology and geomorphology related to Floodproofing and Local Projects are described in Table 4.1-1. Excavation, fill, dewatering, and water diversions could be required for raising or floodproofing structures and Local Projects, depending on the project. These impacts are anticipated to be minor and localized in nature.

4.7.2.2 Long-term Impacts

No adverse impacts on geology are anticipated as a result of Local-scale Flood Damage Reduction Actions.

Local Projects

The implementation of Local Projects could potentially result in adverse impacts on geomorphology due to localized alterations to channel morphology, and limiting channel migration from the placement of bank-stabilization structures. With any bank-hardening component of these projects, there is the potential to redirect flows downstream or to an adjacent or opposite bank, causing erosion or damage to aquatic species habitats. These impacts are anticipated to be minor based on the scale and number of projects currently on the Local Projects list; however, cumulatively hard shoreline stabilization measures could have a more significant impact on geomorphology, depending on reach conditions. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit geomorphology.

Land Use Management

Changes in land use management regulations that protect existing floodplain areas could result in beneficial effects on geomorphology if river channels retain space in which to migrate at natural rates.

4.7.2.3 Mitigation

Potential mitigation measures for short-term impacts on geology and geomorphology are included in Table 4.1-1. No long-term adverse impacts on geology are anticipated, so no mitigation is proposed. Potential minimization and avoidance measures to reduce adverse impacts on geomorphology include minimization in the length of stabilization measures and the use of bioengineering techniques for bank stabilization associated with Local Projects.

4.7.3 Wetlands and Vegetation

4.7.3.1 Short-term Impacts

Floodproofing

The potential short-term impacts on wetlands and vegetation include the installation of Floodproofing components (e.g., farm pads, evacuation routes, floodwalls), which could affect riparian areas and/or wetlands and wetland buffers (depending on their location and proximity to construction activities). Specific impacts include temporary fill placement in wetlands and removal or disturbance of existing upland and wetland vegetation. These impacts are anticipated to be limited in nature and extent (given the limited existing wetlands and vegetation due to disturbance from previous and current land uses), and would be restored to pre-construction status and/or function following completion of Floodproofing.

Local Projects

The potential short-term impacts on wetlands and vegetation related to Local Projects include activities such as land clearing, excavation, fill placement, equipment access, and material storage. Specific impacts include temporary fill placement in wetlands, and removal or disturbance of existing upland and wetland vegetation. These impacts would be limited in nature and extent (given the limited existing wetlands and vegetation due to disturbance from previous and current activities), and would be restored to pre-construction status and/or function following completion of Local Projects.

4.7.3.2 Long-term Impacts

Floodproofing

The potential adverse impacts on wetlands and vegetation are primarily related to direct impacts from the construction of floodproofing measures. Changes in wetland hydrology could also occur if floodproofing structures alter overland flow or shallow subsurface groundwater flow paths, such that floodplain wetlands no longer receive water from overbank flooding or groundwater. The potential adverse impacts would include permanent loss of wetlands, permanent loss of upland and wetland vegetation, and modification of wetland hydrology. Overall, the potential adverse impacts on wetlands and vegetation are limited, and are therefore considered minor due to the small size of these structures and the location around existing development and in developed areas. Elevated structures are generally anticipated to maintain the same footprint as the pre-elevated structure, which would limit adverse impacts on wetlands and vegetation.

Local Projects

The construction of Local Projects could result in potential disconnection of floodplains, wetlands, and off-channel habitat from rivers, as well as direct removal of wetland or riparian vegetation. The potential adverse impacts on wetlands and vegetation from Local Projects are considered minor, based on the scale and number of projects currently on the Local Projects list and their location in relatively

developed areas. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit floodplain wetlands and native floodplain vegetation.

Land Use Management

No adverse impacts on wetlands and vegetation are anticipated. Potential beneficial effects on wetlands and vegetation could occur with preservation of floodplain open space and filling restrictions in the floodplain.

4.7.3.3 Mitigation

Potential mitigation measures for short-term impacts on wetlands and vegetation are described in Table 4.1-1. Potential mitigation measures for long-term adverse impacts on wetlands and vegetation for Floodproofing and Local Projects would be the same as those described for the Airport Levee Improvements, I-5 Projects, and Aberdeen/Hoquiam North Shore Levee.

4.7.4 Fish and Wildlife

4.7.4.1 Short-term Impacts

4.7.4.1.1 Fish

The potential responses of fish to short-term impacts on habitat as a result of the construction of Floodproofing or Local Projects actions are similar to those described in Table 4.1-1. However, impacts would be limited in magnitude because the actions are limited in number and extent, and because the areas in which these projects would occur are currently developed and habitat conditions for fish may currently be relatively impaired.

Short-term impacts on fish could occur if construction takes place immediately adjacent to the Chehalis River and tributaries, and would occur on a limited scale with actions requiring bank stabilization or in-water work. Water quality would be affected by turbidity increases, pollutant-laden stormwater runoff, or pollutants entering the water. Areas could be temporarily dewatered, reducing habitat available to fish in the immediate vicinity of the actions. Other potential impacts on fish could include construction noise in or near the stream channel and removal of bank vegetation, which would reduce the function of riparian habitat for fish (e.g., shading and input of terrestrial nutrients and food). These short-term impacts would have a limited potential for direct fish injury or mortality.

4.7.4.1.2 Wildlife

The potential responses of wildlife to short-term impacts on habitat are similar to those described in Table 4.1-1; however, impacts would be limited in magnitude since the actions are limited in number and extent and because the areas in which these actions would occur are currently developed and likely currently provide limited habitat for wildlife. These temporary impacts could disturb habitat used by native wildlife species to breed, forage, rest, and overwinter.

4.7.4.2 Long-term Impacts

4.7.4.2.1 Fish

The potential adverse impacts on fish are primarily related to changes in bank characteristics, flood extents, and improvements to water quality from bank stabilization in areas experiencing high levels of erosion, and a reduction in sedimentation and risk of wastewater contamination. Each of these actions could affect the quality of fish habitat.

Floodproofing

Floodproofing structures could result in a beneficial effect to fish by reducing potential pollutant loads to surface waters during floods. This could be accomplished as a result of elevating, or otherwise Floodproofing, structures and limiting exposure of the contents to floodwaters. However, protection measures for structures in the floodplain would allow for continuation of activities in the floodplain that are harmful to fish and fish habitat, such as preventing restoration of riparian area vegetation or preventing the creation of off-channel habitat.

Local Projects

Protecting riverbanks, roads, and infrastructure through Local Projects could benefit fish by reducing potential pollutant and sediment loads to the Chehalis River as a result of reducing erosion and improving local water quality. However, bank stabilization could also create minor adverse impacts on fish habitat by permanently altering river hydraulics, velocities, and causing bank erosion in other areas. As noted previously, bank stabilization impacts on fish habitat cumulatively could be more significant, depending on the project setting. In addition, some Local Projects could affect local riparian structure, which could impair fish habitat quality by increasing water temperatures and pollutant runoff, and result in impacts on refugia. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit fish by improving habitat.

Land Use Management

Revising land use regulations and practices could limit future development in the floodplain to some extent, preserving open space and potentially floodplain habitat for fish. Fish like juvenile coho salmon and Olympic mudminnow rely on off-channel habitat, which could be preserved in present open spaces. The potential effects on fish from Land Use Management are considered beneficial. The magnitude of the benefit would depend on the amount of open area preserved, and the efficacy of development restrictions in the floodplain—that is, preventing development in the Chehalis River floodplain rather than allowing development where structures are protected during a 100-year flood by added freeboard.

4.7.4.2.2 Wildlife

Anticipated adverse impacts on wildlife are primarily related to changes in flood extents and potential improvements to water quality during floods. Each of these actions could affect the quality of wildlife habitat used for breeding, foraging, resting, and overwintering.

Floodproofing and Local Projects

Minor adverse impacts could result from potential changes in wildlife habitats, such as wetlands and riparian areas, from the alteration of overland flow paths by floodproofing structures, or direct impacts on wetlands or vegetation during construction of Local Projects. Additionally, clearing existing vegetation would result in minor adverse impacts on native wildlife by reducing the quantity and quality of habitat available. Non-native invasive wildlife species could also populate disturbed areas, creating competition with or displacement of native species.

Aquatic or semi-aquatic wildlife species may benefit from improved water quality if WWTPs, roads and infrastructure, and other potential sources of pollutants are not inundated in future floods. These benefits would be most important to species such as amphibians that rely on high-quality aquatic habitat for breeding and foraging. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit floodplain wetlands and native floodplain vegetation, and therefore wildlife that use these habitats.

Land Use Management

Open space preservation may avoid future impacts on floodplain habitat, which would be considered a beneficial effect for wildlife.

4.7.4.3 Mitigation

4.7.4.3.1 Fish

Some potential long-term impacts on fish would be addressed through mitigation measures outlined in Table 4.1-1. The potential compensatory mitigation measures to address unavoidable minor adverse impacts on fish from Floodproofing and Local Projects would be the similar those identified for the Airport Levee Improvements, I-5 Projects, and Aberdeen/Hoquiam North Shore Levee. Mitigation for bank stabilization projects would generally be site- and project-specific; however, to address the loss of riparian structure, compensatory mitigation could include replanting affected riparian vegetation or restoring floodplain areas of equivalent size or habitat function for fish.

4.7.4.3.2 Wildlife

Some potential long-term impacts on wildlife would be addressed through the avoidance and minimization measures outlined in Table 4.1-1. The potential compensatory mitigation measures to address unavoidable minor adverse impacts on wildlife from Floodproofing and Local Projects would be the same as those identified for the Airport Levee Improvements, I-5 Projects, and Aberdeen/Hoquiam North Shore Levee.

4.7.5 Tribal Resources

4.7.5.1 Short- and Long-term Impacts

The potential construction-related impacts on tribal resources are associated with Local Projects and would be similar to those discussed for the Airport Levee Improvements and I-5 Projects. Construction of Local Projects could involve in-water work and/or could restrict the treaty right of access to tribal fishing areas or other tribal resources. Potential impacts on tribal resources following construction of Local Projects are not anticipated with the exceptions of ongoing maintenance or similar project-related activities. Local Projects that include reconnecting river and stream channels to floodplains have the potential to benefit fish by improving habitat, and therefore may potentially benefit tribal resources.

Protection measures like floodproofing structures in the floodplain would allow for continuation of activities in the floodplain that, cumulatively, are harmful to fish and fish habitat. Land Use Management actions that include development restrictions—that is, prevent rather than allow development, but require protection for structures—are more likely to benefit fish (see Section 4.7.4.2.1), and may therefore benefit tribal resources. The extent of potential impacts on tribal resources from restricted access to tribal fishing areas will be determined through additional coordination with tribes and continued government-to-government consultations.

4.7.5.2 Mitigation

The potential mitigation associated with impacts on tribal resources would be addressed directly with Quinault Indian Nation and Chehalis Tribe tribal leadership during project-level environmental review and continued government-to-government consultations.

Some potential long-term impacts on tribal fish resources could be addressed through avoidance and minimization measures developed in consultation with tribes. These could include avoiding intact riparian vegetation and working in streams or other sensitive areas. Other measures outlined in Table 4.1-1 and related to erosion controls would also be implemented.

Compensatory mitigation measures to address unavoidable adverse impacts on tribal resources from Local Projects should be addressed directly with Quinault Indian Nation and Chehalis Tribe tribal leadership. In some cases, mitigation measures could be proposed to address the impacts on habitat that are important to tribal resources, including fish, wildlife, and plants. Mitigation of impacts on treaty rights is subject to consideration and agreement by the Quinault Indian Nation.

4.7.6 Air Quality

4.7.6.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on air quality related to Floodproofing and Local Projects would vary and would likely last a few weeks to a few months depending on the scale of the individual project. The

impacts would be localized, limited to the construction period, and would not cause an overall decrease in regional air quality.

4.7.6.2 Long-term Impacts

No adverse impacts on air quality are expected because, once completed, it is not anticipated that the Local-scale Flood Damage Reduction Actions would generate emissions above current levels. Any cleared areas could be revegetated to avoid providing future sources of dust.

4.7.6.3 Mitigation

Potential mitigation measures for short-term impacts on air quality would be the same as those described in Table 4.1-1. No long-term impacts on air quality are anticipated, so no mitigation is proposed.

4.7.7 Climate Change

4.7.7.1 Short-term Impacts

4.7.7.1.1 Effects of Local-scale Flood Damage Reduction Actions Contributing to Climate Change

Floodproofing and Local Projects

The potential short-term effects of Floodproofing and Local Projects that would contribute to climate change include additional GHG emissions from construction equipment. GHG emissions resulting from construction activities are expected to be below the annual threshold for qualitatively disclosing emissions and are considered negligible.

4.7.7.1.2 Effects of Climate Change on the Local-scale Flood Damage Reduction Actions

Floodproofing and Local Projects

No short-term effects from climate change on Floodproofing or Local Projects are anticipated.

4.7.7.2 Long-term Impacts

4.7.7.2.1 Effects of Local-scale Flood Damage Reduction Actions Contributing to Climate Change

Floodproofing and Local Projects

The potential effects that contribute to climate change are due to GHG emissions during operation and maintenance activities that could require the periodic use of trucks and/or heavy equipment. The anticipated GHG emission equivalents from operation of equipment are below the annual threshold for qualitative disclosure of emissions as described in Section 4.4.7; therefore, no adverse impacts are anticipated.

4.7.7.2.2 *Effects of Climate Change on Local-scale Flood Damage Reduction Actions*

Floodproofing and Local Projects

The effects of climate change on Floodproofing and Local Projects are increased frequency and intensity of flooding events. More intense heavy winter rains could increase flood elevations beyond anticipated levels, and compromise Floodproofing and Local Projects. Floodproofing actions and Local Projects could be designed to consider climate change (e.g., additional freeboard when raising homes), and similar measures could provide resiliency to changing climate conditions. Therefore, no adverse impacts are anticipated. Local Projects that include reconnecting river and stream channels to floodplains are likely to improve floodplain function, and therefore provide resiliency under future climate change conditions.

4.7.7.3 *Mitigation*

4.7.7.3.1 *Mitigation to Address Effects of Local-scale Flood Damage Reduction Actions Contributing to Climate Change*

It is not anticipated that Local-scale Flood Damage Reduction Actions would contribute to climate change over the long term; therefore, no mitigation is proposed.

4.7.7.3.2 *Mitigation to Address Effects of Climate Change on Local-scale Flood Damage Reduction Actions*

Local-scale Flood Damage Reduction Actions could be designed to be resilient to changing climate conditions, such as more intense winter rains and projected increases in peak flood flows.

4.7.8 *Visual Quality*

4.7.8.1 *Short-term Impacts*

Floodproofing and Local Projects

The potential short-term impacts on visual quality related to Floodproofing and Local Projects include construction equipment and activities that would lower visual quality for the duration of construction, particularly in areas where the construction activity would visually contrast with the surrounding area. Parks, open space, and other natural settings visited by the public would be particularly sensitive to visual impacts associated with construction. These impacts would be relatively small and limited in duration.

4.7.8.2 *Long-term Impacts*

Floodproofing

Elevating existing structures would change the appearance of the buildings and could interrupt views. Purchasing (and removing) homes in the Chehalis River floodplain would potentially result in more open area. Constructing flood barriers, floodwalls, and farm pads would introduce human-made structures where they currently do not exist. Their impact on the existing viewshed would depend on the degree to which they contrast with it; however, because they would be auxiliary to existing structures, these potential adverse impacts are considered minor.

Local Projects

Protection of roads and infrastructure would cause localized changes to views in the areas. The potential adverse impacts from Local Projects are considered minor because of their small scale. Bank protection activities could cause minor adverse impacts on the limited changed views along the Wynoochee and Chehalis rivers.

4.7.8.3 Mitigation

Potential mitigation measures for short-term impacts on visual quality are similar to those described for the Airport Levee Improvements, I-5 Projects, and Aberdeen/Hoquiam North Shore Levee. Potential mitigation measures for long-term impacts on visual quality related to Floodproofing and Local Projects include buffering visual impacts with native trees, shrubs, and other vegetation.

4.7.9 Noise

4.7.9.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term noise impacts related to Floodproofing and Local Projects include construction activities and equipment. Construction equipment likely to be used for construction would include earth-moving, materials-handling, and hauling equipment with peak noise levels ranging from 81 to 89 dBA at 50 feet from the source (see Table 4.2-10). Construction noise would likely be a disturbance to nearby residents, but the impacts would not be significant because noise levels would decrease to safe levels before reaching homes and would be limited to daytime hours.

4.7.9.2 Long-term Impacts

No adverse impacts are anticipated because none of the completed projects would generate noise in excess of current conditions.

4.7.9.3 Mitigation

Potential mitigation measures for short-term noise impacts would be the same as those described for the Airport Levee Improvements and I-5 Projects. No long-term noise impacts are anticipated with the Local-scale Flood Damage Reduction Actions, so no mitigation is proposed.

4.7.10 Land Use

4.7.10.1 Short-term Impacts

Floodproofing

No potential short-term impacts on land use are anticipated as a result of Floodproofing.

Local Projects

No potential short-term impacts on land use are anticipated as a result of Local Projects.

4.7.10.2 Long-term Impacts

Floodproofing

This action element estimates that 75% of residential structures in the Chehalis River floodplain could be elevated above BFE. If elevation of a structure is more expensive than the value of the land and structure combined, the structure and land could be purchased. The potential effects on land use from Floodproofing are beneficial and include reductions in flood damage for residential land uses.

Floodproofing also would be employed to reduce flood damages to other land uses, where approximately 25% of residential structures and 75% of commercial, industrial, government, school structures have the potential to be floodproofed. The installation of farm pads that provide refuge from floodwaters and the creation of livestock evacuation routes would benefit agricultural land uses.

Local Projects

No adverse impacts on land use are anticipated. The potential effects on land use associated with Local Projects primarily include the reduction in the risk of flood damage to structures and key infrastructure or priority areas, reducing the risk of flood damage or disruption to land uses.

Land Use Management

Land Use Management actions are intended to affect patterns of development within the floodplain. Floodplain protection and construction standards proposing to minimize development in flood-prone locations, protect natural floodplain functions, and more effectively protect buildings in the floodplain could be enacted, with the goal of effecting a long-term impact on land use. This would be considered a beneficial effect on land use in the context of reducing flood damage. A *Build Out Analysis* was conducted to evaluate the potential effectiveness of Land Use Management actions in the floodplain of this type (see Appendix L). Due to the abundance of existing developable parcels in the Chehalis River floodplain, the results indicated that subdivision set asides, and low density or large lot zoning, would be unlikely to significantly limit further development in the Chehalis River floodplain. While Land Use Management actions could have an effect on land use, regulations that more directly restrict floodplain development could be more effective at preventing potential future flood damage. Land use changes that restrict development potential on existing parcels could be considered minor adverse impacts from the perspective of individual property owners. More information on the potential effectiveness of Land Use Management actions in the floodplain is included in Appendix L.

4.7.10.3 Mitigation

No short-term impacts on land use are anticipated as a result of implementing Floodproofing or Local Projects, so no mitigation is proposed.

Floodproofing and Local Projects

No long-term adverse impacts on land use are anticipated with Floodproofing and Local Projects, so no mitigation is proposed.

Land Use Management

Land Use Management changes that represent a departure from a community's current comprehensive plan or development regulations would need to demonstrate that such standards continue to provide sufficient suitable land for development to accommodate allocated housing and employment growth, per the provisions of GMA. Significant adverse impacts on land use are not anticipated under the proposed floodplain protection and construction standards.

4.7.11 Recreation

4.7.11.1 Short-term Impacts

Floodproofing and Local Projects

Potential short-term impacts on recreation related to Floodproofing or Local Projects would occur during construction, and include construction noise and dust on properties located adjacent to parks or other recreational facilities. These impacts would be limited to the construction period, which would likely be several weeks to several months.

4.7.11.2 Long-term Impacts

Floodproofing and Local Projects

Floodproofing would not affect any recreational areas and would therefore have no adverse impact. Floodproofing could result in a beneficial effect on recreation if farm pad projects protect livestock and equipment for farms used for agritourism. Some Local Projects could result in benefits to recreation because they could help maintain access to parks or other recreational areas by reducing flooding of access roads.

4.7.11.3 Mitigation

No short- or long-term adverse impacts on recreation are anticipated with Local-scale Flood Damage Reduction Actions, so no mitigation is proposed.

4.7.12 Historic and Cultural Preservation

4.7.12.1 Short- and Long-term Impacts

Floodproofing and Local Projects

The potential impacts on cultural resources related to Floodproofing and Local Projects that could occur during construction are related to ground disturbance and filling to floodproof (raise or make other alterations) frequently flood-damaged properties or farm pads. The purchase and demolition of frequently flood-damaged properties, or infrastructure improvements implemented under Local Projects, could also affect cultural resources during construction. Potential impacts include the following:

- Destruction, damage to, or alteration of a cultural resource
- Necessary removal of a cultural resource from its original location

- Changes to the use or physical features of a cultural resource
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the significant features of a cultural resource

The extent of impacts would depend on the nature of cultural resources that could be disturbed, which would be determined through coordination with DAHP and affected tribes during a project-level environmental review, including continued government-to-government consultations. Potential impacts on tribal cultural resources or graves, Indian human remains, or traditional cultural properties may also occur and would be determined in coordination with tribes, and government-to-government consultations.

The potential impacts on cultural resources associated with Floodproofing and Local Projects that could occur following construction are associated with the alteration or removal of existing frequently flood-damaged properties, which could expose, damage, destroy, and/or alter cultural resources through additional, increased, or changed vehicular and foot traffic patterns. Different flood patterns, which could cause flooding and sedimentation of any submerged resources in different areas, change stream channels and cause erosion, and change the streambank locations, which results in bank erosion. These changes could expose, damage, destroy, and/or alter cultural resources downstream of the Local Projects. Potential adverse impacts are considered minor for Floodproofing, as these actions are not anticipated to require substantial ground disturbance that could affect significant archaeological materials. Potential adverse impacts for Local Projects are considered moderate to significant due to the potential to affect cultural resources due to different flood patterns, although as described previously, this would be determined during coordination and consultation with DAHP and affected tribes under the project-level environmental review.

4.7.12.2 Mitigation

Mitigation measures for potential impacts on cultural resources would be determined during project-specific evaluations, and would include consultation with DAHP, interested and affected tribes, as well as other consulting parties (see information on addressing potential impacts on cultural resources in Section 4.2.12). The potential compensatory mitigation measures would be the same as those described for the Flood Retention Facility (see Section 4.2.12.2).

4.7.13 Transportation

4.7.13.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on transportation related to Floodproofing and Local Projects include temporary disruptions to local roadways. These impacts would be limited in duration and access to properties would be maintained to the extent possible.

4.7.13.2 Long-term Impacts

Local Projects

Local Projects that protect roadways would reduce road closures in specific locations during major floods, resulting in beneficial effects.

Land Use Management

Limitations on the construction of new roads in the floodplain would reduce the number of roads inundated during floods, and limitations on residential development in the floodplain would reduce incidences of blocked access to residential areas during floods. Therefore, Land Use Management would result in beneficial effects.

4.7.13.3 Mitigation

Mitigation measures for short-term impacts would be similar to those for the Airport Levee Improvements and I-5 Projects. No long-term impacts on transportation are anticipated with Local-scale Flood Damage Reduction Actions, so no mitigation is proposed.

4.7.14 Public Services and Utilities

4.7.14.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on public services and utilities related to Floodproofing and Local Projects include reduced accessibility and temporary disruption of public services that rely on having consistent access to their customers (e.g., garbage collection). However, impacts would be limited through proper mitigation (i.e., use of detours or maintain property access). Local Projects to protect WWTPs would be designed so that operations are not disrupted during construction; therefore, no disruption of services is anticipated. Short-term impacts would occur due to implementation of construction mitigation measures and limited construction periods.

4.7.14.2 Long-term Impacts

Floodproofing

Floodproofing structures in the floodplain would reduce flood impacts and help maintain public services and utilities structures and uses during floods. These potential effects are considered beneficial because they would protect a limited number of public services and utilities. Any utility relocations would be localized, causing minor adverse impacts.

Local Projects

Local Projects would result in beneficial effects where such projects protect specific WWTPs and other utilities during floods. Local Projects could require utility relocations, either on the current site or to nearby areas off site, resulting in minor to moderate adverse impacts.

Land Use Management

Changes to land use regulations would positively affect public services and utilities by restricting the placement of public service facilities and utilities in the floodplain, reducing flood damage and the need to repair utilities in the future.

4.7.14.3 Mitigation

Potential mitigation measures for short-term impacts on public services and utilities would include measures to maintain access and public services similar to those described for the Airport Levee Improvements. The minor to moderate long-term adverse impacts associated with utility relocations would be mitigated by coordination with service providers and property owners.

4.7.15 Environmental Health and Safety

4.7.15.1 Short-term Impacts

Floodproofing and Local Projects

The potential short-term impacts on environmental health and safety related to Floodproofing and Local Projects would occur during construction and include temporary disruptions to local roadways, causing minor delays to emergency response during construction. These impacts would be limited to the construction period.

4.7.15.2 Long-term Impacts

Floodproofing

Floodproofing could reduce the demand for emergency response services during a flood because residences and commercial buildings would no longer be inundated, or inundated to a lesser extent, and the risks to health and safety of inhabitants of those structures would be reduced as a result. Floodproofing residences and commercial buildings could reduce floodwater contamination from hazardous materials. These effects would be beneficial at the locations in which they are applied.

Local Projects

Local Projects could somewhat reduce the demand for emergency response services through localized flood damage reduction and maintaining road access. Flood protection of WWTPs would reduce the potential for floodwater contamination by keeping the WWTPs operable during major floods. Minor reductions in threats to human health and safety would create a beneficial effect to the community.

Land Use Management

Updated regulatory standards would require a higher level of protection for critical facilities (facilities that are vital to flood response activities or public health and safety, as well as those that could release hazardous materials into the environment during flooding). New facilities would either be prohibited from locating within the 500-year floodplain, or be protected from damage and loss of access during a 500-year flood through more stringent construction standards. Regulatory standards that minimize new

development in the floodplain would reduce risks to public safety and potential impacts on emergency services. Therefore, beneficial effects on public health and safety could result from improvements to Land Use Management.

Flood Warning System

Implementing improvements to the flood warning system would improve flood forecasts and increase the lead time for flood warning, resulting in a beneficial effect on environmental health and safety.

4.7.15.3 Mitigation

No short- or long-term adverse impacts on environmental health and safety are anticipated, so no mitigation is proposed.