CITY OF LANGLEY

SHORELINE MASTER PLAN

SEA LEVEL RISE ASSESSMENT

Prepared by
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This assessment is based upon the sea level rise projections detailed in the following:
Miller, I.M., Morgan, H., Mauger, G., Newton, T., Weldon, R., Schmidt, D., Welch, M., Grossman, E. 2018. Projected Sea Level Rise for Washington State – A 2018 Assessment. A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, University of Oregon, University of Washington, and US Geological Survey. Prepared for the Washington Coastal Resilience Project. updated 07/2019
Sea Level Rise In Washington State – A 2018 Assessment (Miller et al., 2018).

Sea Level Rise in the City of Langley SMP

Introduction

The City of Langley (City) is updating its Shoreline Master Program (SMP) to comply with the requirements of the Washington State Shoreline Management Act (SMA or the Act) (RCW 90.58). The purpose of this Assessment is to inform the City of Langley's Shoreline Master Plan update, to educate City Council, property owners and other stakeholders regarding the impending threat of sea level rise within the Shoreline Plan Area (Plan Area), that is 200 feet of the ordinary high water mark[1].

This strategy has been prepared consistent with the following:

- The Shoreline Management Act;
- Master Program elements of RCW 90.58.100;
- The Langley Comprehensive Plan; and
- Department of Ecology Shoreline Planning staff guidance.

City Council, City staff, property owners and other stakeholders are increasingly aware of the threats associated with climate change. The City's Comprehensive Plan updated in 2018 contains policies directing the City to begin planning to reduce our collective and individual emissions and to begin undertaking climate change adaptation planning and actions. Recent and finer grained technical analyses of sea level rise provide local governments with defensible data to implement new regulations to minimize some of the associated risks.

The City is aware that because the SMA only applies to areas located within 200 feet of the ordinary high-water mark, the City must begin to review and amend other policy documents and regulations to start addressing impacts that are likely to occur beyond the Plan Area.

Climate Change

In 2018 at a UN General Assembly meeting the Secretary-General António Guterres declared *"Climate change is moving faster than we are – and its speed has provoked a sonic boom SOS across our world[2]."* He continues by noting the World Meteorological Organization (WMO) data shows that the past two decades have included eighteen of the twenty warmest years since record-keeping started in 1850.

The most recent Intergovernmental Panel on Climate Change (IPCC) IPCC report published in 2018 shows that recent trends in emissions and the level of international "ambition" is not going to have any effect on keeping global temperatures well below 2°C. The report states that

[1] RCW 90.58.030(d)

[2] This Special Report on Global Warming of 1.5°C, an IPCC Special Report on the impacts of global warming of 1.5°C above pre- industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, is the first publication in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6).

the average global temperature has risen about 1ºC (1.8ºF) since pre-industrial times. If the current rate of warming continues, this number is expected to nearly double in a relatively short time, reaching 1.5ºC (2.7ºF) between 2030 and 2052. Without increased and urgent mitigation actions, leading to a sharp decline in greenhouse gas, we will experience irreversible loss of the most fragile ecosystems, and crisis after crisis for the most vulnerable people and societies[3].

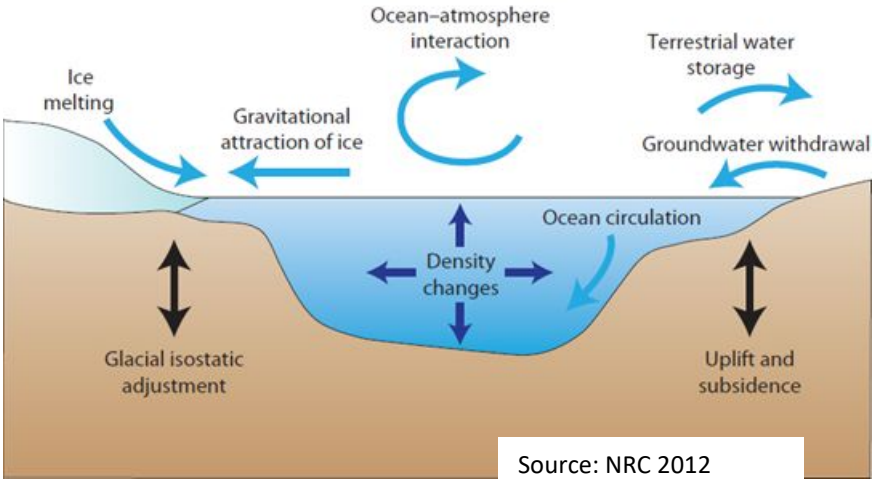
One of the direct implications of increasing and unmitigated greenhouse gas emissions is sea level rise. While some coastal communities in Washington have been preparing and implementing adaption actions in response to this threat for many years, for example Olympia, King County, Swinomish Tribes, and Quinault Tribes. Many coastal communities are just beginning this process. The City of Langley's Comprehensive Plan identifies the existential threat of climate change and its related impacts. Goals and policies have been adopted in the Comprehensive Plan to direct the City to begin adaptation and mitigation planning.

This assessment does not discuss the mitigation side of climate change planning. That is how we as a community can work on actions to reduce our individual and community greenhouse gas emissions. These efforts will be addressed through other plans, projects and initiatives.

This assessment recognizes that adapting to climate change and mitigating to reduce greenhouse gas emissions is multi-dimensional. Sea level rise and increased frequency and magnitude of extreme storm events are significant implications of climate change. The SMP is one tool that we can use to begin planning around sea level rise and its concomitant impacts. The SMA does not require local governments to undertake planning related to this threat however, DOE has prepared "Addressing Sea Level Rise in Shoreline Master Programs" publication no 11-06-010 rev 12/17 and Appendix A to the SMP Handbook to provide guidance to local governments who want to begin addressing sea level rise in their SMP updates. Both documents were consulted in the preparation of this assessment.

[3] ibid

Many variables contribute to the rate of sea level rise and we cannot predict how high and when our shorelines will be affected. We do know that higher seas will increase the flooding risks particularly at lower elevations if we don't take any action. A recent study prepared by Mulkern et al., 2020, based upon the Miller et al., 2018 analysis projects that Island County will likely experience sea level rise of 1-3 feet by the year 2100. Adaption actions require collaboration between different City departments, private businesses and property owners, County and State agencies as well as other community stakeholders.



Source: NRC 2012

There are imperatives [4] guiding why the City of Langley should begin to act and plan on climate change related impacts and sea level rise in particular:

- Physical imperative – Langley contains 1.73 miles of shoreline that is built out. The majority is comprised of high bluff properties but there are also areas of low bluff that are susceptible to impacts related to sea level rise. The uses along Langley's shoreline include a mix of single-family residences, private businesses, public parks, the Marina and critical City infrastructure for water, wastewater and stormwater.
- Policy imperative – While the State does not require cities and counties to plan for climate change impacts, Langley City Council recognizes the threats associated with climate change. The recently adopted Comprehensive Plan gives direction to the City to begin acting. The SMP update, currently under review, is on an eight-year cycle which creates an opportunity during this update cycle to begin adopting new policies and regulations to address sea level rise.
- Economic imperative – Key pieces of Langley's infrastructure are located in areas that will be impacted by sea level rise. Also, Langley's downtown is located on the bluff above low bank properties that will be impacted. Being proactive and working towards and implementing adaption actions is far less expensive than having to react when we are faced with emergencies.

[4] Arlington Group Planning and Architecture Inc. et al., 2013

Langley's Context

Langley is a small historic city that was platted in 1890 and incorporated in 1913. Its strategic location on the north west side of Whidbey Island made it attractive for the white settlers. In those early years, the City could only be accessed from the water.

Langley is very small city with one square mile in area. It has 1.73 miles of shoreline making up only 1% of Island County's shoreline. Langley is one of three incorporated jurisdictions in the county and where the Growth Management Act directs higher density development and a greater range of land uses. Langley has full community services – sewer, water, stormwater, public transportation and is a compact walkable community with many attributes making it a desirable place to live, work and recreate. Langley and South Whidbey Island is a cultural hub for artists of all genres. It is one of the main service centers in South Whidbey.

The three - block historic downtown is located on 50-foot bluffs overlooking Saratoga Passage. At the toe of this bluff running the length of downtown (approximately .5 mile) is made up of private residential property, public parks, Nichols Brothers Boat Builders satellite dock, the Port of South Whidbey's Langley marina and public infrastructure including two sewer lift stations, sewer line and outfalls.

Detailed Shoreline Descriptions

The Shoreline Inventory and Characterization Report[5] (ICR) was prepared to establish "baseline" conditions of Langley's shoreline. Establishing baseline conditions is necessary to evaluate cumulative impacts over time to ensure that the SMP's goals, policies and regulations are achieving no net loss of shoreline ecological functions. The Shoreline Inventory report establishes three shoreline 'reaches'. This reach scale assessment analyses and assesses the conditions in each reach, identifies key management issues and provides conceptual restoration opportunities.[6] The results of Shoreline Inventory report were then used to inform the Cumulative Impacts Assessment[7] (CIA). The CIA assesses the cumulative impacts of development in the shoreline resulting from development and shoreline uses over time. The CIA also establishes the shoreline designation for each reach.

The three shoreline reaches are identified as Langley West, Central and East and the respective corresponding shoreline designations are Shoreline Residential, Urban and Shoreline Residential. Figure no. 1 below is an excerpt from the 2013 SMP and identifies both the upland and aquatic designations. The shoreline located at the eastern most extent is located outside of City limits and was part of the unincorporated UGA. This portion of the shoreline is removed

[5] ESA, 2011
[6] Ibid 9
[7] ESA, 2013

from the SMP update because the unincorporated UGA was reduced in size as part of the 2016 Island County Comprehensive Plan and 2018 Langley Comprehensive Plan. This figure will be replaced with an updated figure for the final draft document.

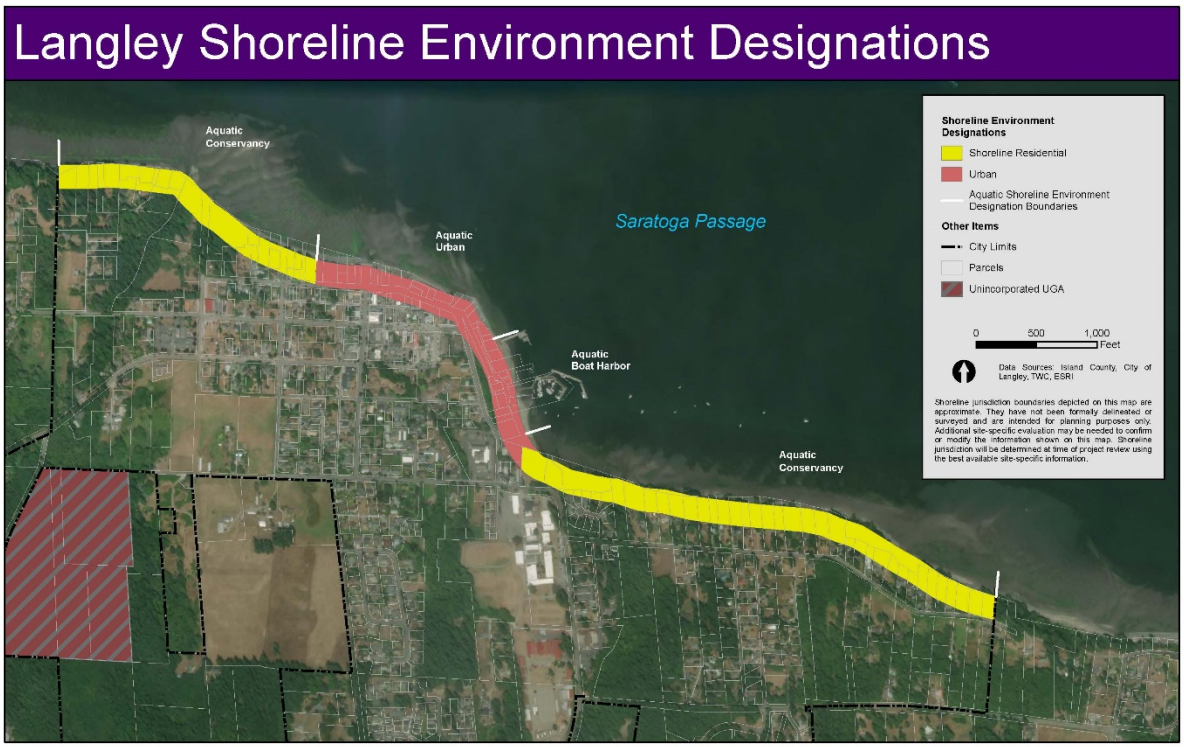


Figure No. 1 – Langley Shoreline Environmental Designations (map revised from draft SLR document)

The following descriptions are excerpts from the CIA[8].

Langley West (Shoreline Residential) is located west of downtown Langley and is .45 miles in length. The reach is made up of approximately half feeder bluff shore type and half low bluff with shoreline modifications. The high bluff portion is ranging from moderately to well-vegetated with mixed forest and shrub communities. Some evidence of sloughing is apparent. The other half of this reach has been modified with a bulkhead that supports three single family residences. Saratoga Creek flows via pipe under a beach front home and exits to an outfall within a concrete bulkhead. (figure 2, pg 12)

Langley Central (Urban) extends .48 miles from a point east of Park Avenue through Langley's downtown and the harbor area to the east end of Wharf Street. The riparian vegetation is

[8] ESA, 2013

generally lacking due shoreline armoring and modification. The shoreline is completely armored (and backfilled) through Seawall Park. This reach accommodates much of the City's water-dependent uses and public access to the shore. While new development is proposed within Langley Central, the risk to existing shoreline functions is relatively low because of the altered nature of existing shoreline functions documented in the ICR. It is also important to recognize that while local sediment transport processes in Langley have been altered by shoreline armoring and overwater structures, the city lies in a process unit that has some of the least degraded geomorphic processes in the Puget Sound. Also noteworthy is that Langley's .5 miles of urban shoreline implements other policies objective of RCW 90.58 by providing shoreline space for water-dependent uses as well as public access. (figure 3, pg 14)

Langley East (Shoreline Residential) measures .8 miles in length and is primarily high bank with two small areas that have been modified. The beach is categorized as bluff-backed. The shoreline slopes are steep and mostly well vegetated with mixed forest and shrub communities on the face and toe of the slopes. There is evidence of recent sloughing. Shoreline uses here are large lot residences. Some of the residences are located in close proximity to the bluff's edge and most of these properties have been cleared of vegetation. (figure 4, pg 16)

Extensive vegetation clearing along the shorelines has been done and continues in order to accommodate the upland residential, commercial and recreational development. Along Langley's waterfront bulkheads have been constructed to protect development from coastal erosion. In addition to this shoreline armoring, development has resulted in the loss of marine riparian vegetation, a lowered capacity to slow and filter run off and increased over water coverage. These factors have reduced the functioning of nearshore habitats.

According to the CIA, the risks to existing shoreline functions from new development is minimal as opportunities for new development along the shoreline are severely limited. The risk to shoreline functions from redevelopment is higher since the residential areas are largely developed. As the impacts of sea level rise become increasingly apparent property owners wanting to redevelop their properties and protect their long-term investment will need to factor sea level rise into their plans. This can take the form of a different actions, for example increasing base flood elevations for buildings and structures, or raising bulkhead heights.

Science of Sea Level Rise

Sea level rise is occurring due to an increase in the world's oceans levels caused by global warming. Burning fossil fuels release carbon dioxide and other heat-trapping gasses into the atmosphere. The oceans then absorb much of this heat and as water becomes warmer, it expands resulting in ocean levels rising worldwide.

Land-based ice, such as glaciers and ice sheets located in Greenland and Antarctica, is also affected by global warming. Typically, they melt during the warmer months of the year and the ice is replenished in colder months. With the average year-round global temperatures rising, however, ice caps and glaciers are experiencing a disproportionate amount of melting at an accelerated rate.

Sea level rise poses a serious threat to coastal life around the world. Consequences include increased intensity of storm surges, flooding, and damage to coastal areas. These areas are home to large populations, in addition to fragile wildlife habitats. We are already seeing communities move buildings, structures and critical infrastructure further inland. Rising seas can also contaminate soil and groundwater with salt impacting people living further inland.

Predicting how high the sea levels will rise is difficult. However, considerable research has been done globally and locally. Recent research undertaken by the Washington Coastal Resilience Project has produced some critical study about sea-level rise in Washington. The report "Projected Sea-Level Rise for Washington[9]", is an important contribution to our local understanding about sea-level rise in Washington. This study provides sea-level rise projections that are probabilistic, localized to a community scale and incorporates new science. The previous Washington based assessment was completed in 2012 and did not have the level granularity.

The future scenarios identified in the report are based upon assumed levels of greenhouse gas emissions. The Miller et al. assessment uses a "low" emission scenario and a "high" emissions scenario; RCP[10] 4.5 and RCP 8.5 respectively. The "high" scenario was selected for Langley's planning purposes for a few reasons. Globally we continue to see no downward trend of greenhouse gas related emissions. As noted above, the most recent IPCC study states our global climate will increase by another 1.5ºC (2.7ºF) between 2030 and 2052, threatening our global sustainability. Societally we are doing little to change our habitats and reduce our individual and collective emissions.

The projections are probabilistic. This means that the researchers assessed the likelihood that sea level rise will meet or exceed a certain level relative to present based on a given emissions scenario. The modelling involved running 10,000 trials for each causal factor of sea level rise resulting in a new estimate for each trial for a particular time period and GHG scenario. From there they estimated the amount of sea level rise associated with specific probabilities of exceedance. The range of projections reflects the uncertainty in the observed and modelled response of sea level rise to climate change. The probabilities consider the unpredictability of

[9] Miller et al., 2018
[10] Representative Concentration Pathway

various factors such as the rate and magnitude of ice melt from Antarctica and Greenland, for example[11].

The projections do not account for storm surge which is a rise in the water levels above the regular astronomical tide that are caused by a severe storm's wind, waves, and low atmospheric pressure. These are regular occurrences, but climate change will increase the intensity of large storm events. The resulting storm surges will cause greater flooding over larger areas[12]. Based on modelling the most extreme coastal storm events between 1980 and 2016[13] determined that most of Puget Sound experiences similar storm surges during extreme events, with an average maximum height between 2.5 and 3.0 ft.

Past studies established 'absolute' levels of sea level rise without considering the localized tectonic activity. The research completed by Miller, et al (2018) assessed data for 171 locations along Washington's coastline to account for this geographic variability in vertical movement (i.e. subsidence or uplift) of the lands surface. For example, lands on the outer coast of the State, such as the northwest Olympic Peninsula are experiencing uplift while lands in the Puget Sound, like Whidbey Island, are experiencing subsidence.

Island County Planning Department, with assistance from the Washington Coastal Resilience Project and others, completed detailed work related to sea level rise[14]. Sea level rise of 1-3 feet is projected as likely for Island County by the year 2100[15]. Projections[16] outlined below in Table No. 1 are based on the analysis of Miller, et. al. 2018. The actual projections can be found on the Coastal Hazards Resilience Network (CHRN) website[17]. The Island County projections were averaged over 13 different locations. The projections for the reach in which the City of Langley is located is virtually identical to Island County's averaged projections. There is a minimal difference of 2.5 inches lower in the 95% probability over the longer term. Because the difference is so small, is over an eighty-year time period and is subject to considerable change, the City will use the Island County averaged projections to maintain consistency.

[11] Miller, et al, pg 17
[12] Grannis pg 5
[13] Miller, I.M., Yang, Z., VanArendonk, N., Grossman, E., Mauger, G. S., Morgan, H., 2019. Extreme Coastal Water Level in Washington State: Guidelines to Support Sea Level Rise Planning. A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, Oregon State University, University of Washington, Pacific Northwest National Laboratory and U.S. Geological Survey. Prepared for the Washington Coastal Resilience Project.
[14] Mulkern et al., 2020
[15] Miller et al., 2018
[16] All projections are given relative to average sea level for 1991 - 2009
[17] http://wacoastalnetwork.com/chrn/research/sea-level-rise-research/

Miller et al. note that these probabilistic projections are well suited for consideration of risk management. For example, high-impact low probability projections maybe more suited when making decisions for critical infrastructure. In contrast, low-end or mid-level projections maybe more practical for making decisions on matters that may be more able to adapt in the future.[18]

	Very Likely 95% probability	Likely 50% probability	Unlikely 1% probability
2050	0.3	0.8	1.5
2070	0.6	1.3	2.6
2100	1.0	2.2	5.0

Table no. 1 RCP 8.5 Sea-level Rise Projections Averaged for Island County in feet based on Miller et al projection, as outlined in Island County Shoreline Master Program and Sea-level Rise Workshop, March 19, 2019.

Based on these analyses, Langley could potentially experience rises in sea levels from 0.3 and 5 feet between 2050 and 2100. At the December 16th special meeting of the Langley Planning Advisory Board, the members recommended that the City base its decisions on the 50% probability elevations as shown in the table above. Note that these elevations do not include a factor for the estimated 3 feet of storm surge.

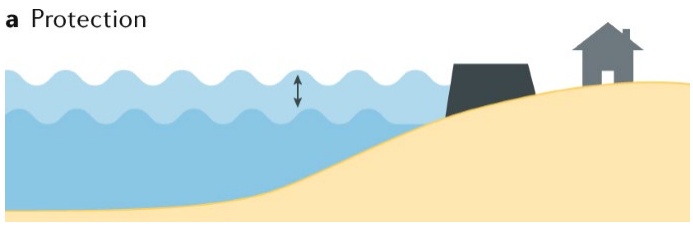
The maps prepared for this assessment can be found in Appendix Nos. 1 and 2 for each time period. These maps reflect these probable elevations and show the projected extent of inundation that the City can expect to experience due to sea level rise for each shoreline reach. There are two sets of maps that show the 50% probability of 0.8 feet projected for 2050 and 2.2 feet projected for 2100. Storm surge of 3 feet is also shown as a separate layer on each map. The low-lying areas of the City in the Langley West and Central reaches are projected to have the greatest threat to flooding caused by sea level rise. A more detailed discussion about the assets that are likely to be impacted is in the section below entitled 'Vulnerability Assessment'.

Adaptation Measures

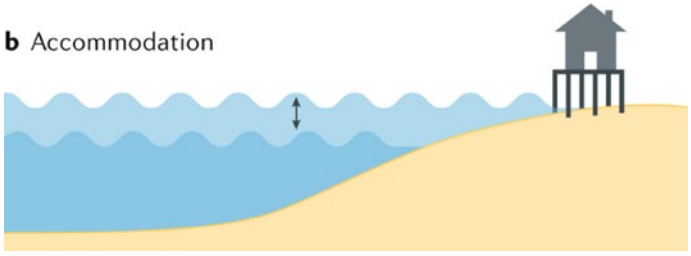
The projected sea level rise for South Whidbey has the potential to impact private and public property, infrastructure and habitat along Langley's shoreline. The opportunities to address these impacts, a range of adaptation measures can be evaluated to assess what might be the most appropriate action for a particular use or location. Generally, dealing with structures that are already exist in high-risk areas is much more difficult than limiting future development. Adaptation measures are generally broken down into three categories:

[18] Miller et al. 2018

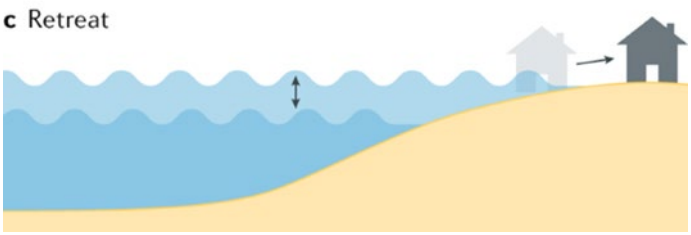
1. **Protect** – This measure prioritizes protecting people, property and infrastructure[19]. This is a reactive strategy and is often the first response. But it can be expensive and can have limited long-term effectiveness in highly vulnerable locations. These measures can be hard or soft barriers that are constructed or installed, for example bulkheads or 'naturalizing the shoreline'.



2. **Accommodate** – The measure has to do with changes to human activities or infrastructure to adapt to SLR. It allows continued development of new structures but manages risk by conditioning development to require that structures be built or retrofit to be more resilient to SLR impacts[20] (). Actions include retrofitting an existing building to increase the flood construction elevation to allow the natural systems to continue while human use is modified to minimize the impacts. Typical measures include elevating structures or floodproofing



3. **Planned Retreat** – This is a strategic decision to relocate or abandon private or public assets that are at risk. Armoring is limited and development or redevelopment in high risk areas is discouraged or not permitted. This involves physically moving away from the hazard and is more long-term strategy that allows natural systems to occur without human intervention[21].



Of course, another response is to do nothing. However, this 'non-response' can result in costly reactive actions[22].

Images[23]

[19] Grannis, pg 14
[20] Grannis, pg 14
[21] ibid
[22] The Arlington Group pg 4-5
[23] Hauer, M.E., Fussell, E., Mueller, V. *et al.* Sea-level rise and human migration. *Nat Rev Earth Environ* **1,** 28–39 (2020). https://doi.org/10.1038/s43017-019-0002-9

These adaptation measures have been considered for their applicability within this assessment. The focus is on the two measures of protect and accommodate. There are significant challenges associated with implementing the retreat measure particularly for low bluff properties as these properties tend to be small lots located at the toe of the bluff. The constraints are physical, legal, and financial. As a result, the draft policies and strategies outlined in this assessment for inclusion into Langley's SMP focus on the measures to protect and accommodate.

Municipal Policy and Regulation

Due to the uncertainty, complexity and inter-related nature of climate change and its impacts, adaptation strategies and actions need to be able to be modified to achieve better performance as our knowledge improves and the risks becomes more apparent. These strategies need to work well across the range of possible futures for the City to be resilient over the long-term. The SMA requires local governments and state agencies to review their plans, regulations, and ordinances that apply to areas adjacent to shoreline jurisdiction and modify those plans, regulations, and ordinances so they "achieve a consistent use policy" in conformance with the Act and the SMP[24]. This means that the City's comprehensive plan and development regulations must be consistent with the SMP overall.

The City has adopted other long-range plans that guide City Council and staff decision-making and annual budgeting. These plans are implemented through the adoption of new regulation or amendments to existing regulations and the development of new programs and strategies. The regulations guide how the City and private property can be developed and establishes standards which must be met. Some of the long-range plans specifically identify the existential threats of climate change but there are no binding requirements for any development taking place in areas impacted by sea level rise.

Long Range Plans

Comprehensive Plan was updated and adopted in 2018. This plan articulates goals, objectives, policies, actions, and standards that are intended to guide the day-to-day decision making for elected officials and local government staff around planning and land use. The Land Use element of the Comprehensive Plan (pg LU-6) includes a brief narrative about climate change and how it will impact the City, with specific reference to vulnerabilities such as coastal flooding, coastal erosion and landslides, and seawater well intrusion. The one policy that specifically references sea level rise is LU-8.19 *Review base flood elevations to incorporate a factor for sea level rise*.

[24] RCW 90.58.340

The Sustainability element (pg S-3) also includes a narrative, a goal and related policies that encourage the City to begin adaptation and mitigation planning to ensure Langley can become more resilient to the impacts of climate change and also to undertake planning efforts that encourage reduced reliance on fossil fuels.

Appendix No. 3 details the specific Comprehensive Plan climate change adaptation and mitigation planning policies. These policies focus primarily on the necessity of reducing our collective greenhouse gas emissions to mitigate for increasing climate change impacts. Given the size of Langley and its temperate climate, the City is well suited to continue to implement sustainable measures that encourage walkability, cycling and the use of public transit, reduce the use of fossil fuels for heating/cooling, increase residential densities and permit a mix of land uses.

The next periodic update of the City's Comprehensive Plan must be completed by 2025. Climate change mitigation and adaptation planning is expected to be a significant focus of this update.

Shoreline Master Plan is another key planning document for the City. It was adopted in 2013 and is now under review. The SMP regulates development activities within the designated planning area and provides for appropriate shoreline uses by encouraging land uses that enhance and conserve shoreline functions and values. Langley's 2013 SMP contains one policy related to sea level rise and is found in section 4.4 Flood Hazard Management and reads:

> 4.4.4.1.6. *When reviewing projects that could be affected by sea level rise adjust development standards such as building setbacks or elevation as necessary to minimize potential damage from flooding.*

This assessment is intended to inform the SMP update and recommends policies and regulations that recognize the risks associated with sea level rise. A more detailed discussion of vulnerabilities and risks located in the shoreline planning area is outlined below.

Each utility has its own plan and these are briefly described below. These plans are relevant for this discussion because none of them mentions climate change and related impacts. As they are updated the City can begin to identify and analyze the climate change impacts, possible actions and strategies that can be incorporated to ensure these utilities are resilient to longer term impacts of climate change.

Langley Water System Plan (2018) guides future planning and operation of the water system. Specific actions and recommendations are detailed, and these form the annual budgets and work plans for the Department of Public Works and utilities. The RCWs required cities update water plans on a six-year cycle but this was recently changed to 10 years. The update to

Langley's water plan is almost complete. The background section of the draft Water System Plan includes a brief discussion about climate change including the associated impacts such as sea level rise but no adaptation actions or policies are identified in the Plan.

Langley Sewer Comprehensive Plan (2015) guides future planning and operation of the sewer system and specific actions and recommendations are detailed. Annual capital infrastructure planning is shifted based on condition assessment and funding availability. Department of Ecology does not require comprehensive plans be prepared but industry best practice is to update it every 6-10 years. The 2015 plan update is anticipated to begin in 2024.

Langley Stormwater Comprehensive Plan (2009) guides future planning and operation of the storm water infrastructure. This plan is scheduled to be updated in 2024. Industry best practice is to update 6-10 years and there are no statutory requirements to update the plan. In recent years, the City has received two applications to mitigate for previously poorly managed upland storm drainage causing significant slope sloughing at the top of the bluff.

Hazard Mitigation Plan – The City of Langley as a planning partner to the Island County Multi-Jurisdictional Hazard Mitigation Plan (HMP) (2015) has adopted the HMP locally. The HMP identifies hazards and mitigation opportunities and recommendations related to a range of hazards such as coastal erosion, flood, landslide and numerous others. Potential climate change impacts are identified and discussed for each hazard type but no specific recommendations related to climate change and sea level rise are identified in the action plan matrix with one exception:

> *C-15 Implement cost-effective measures to address vulnerability of facilities at risk to sea level rise, extreme high tides and storm surges as they relate to potential inflow of saltwater. This includes working with local private water purveyors.*

The Plan relies on FEMA 100 and 500-year floodplain data which does not account for climate change related factors for sea level rise and storm surge.

A revision to the Island County Hazard Mitigation Plan[25] is underway and the draft includes updated sea level rise projections as well as specific guidance to incorporate climate change and sea level rise considerations into mitigation strategies. The City is in the process of completing the necessary steps to be partner to this plan.

Langley Regulations

Langley Municipal Code (LMC) General Provisions Ch. 15.01 – The standards in this chapter govern all new construction and upgrading of facilities both in the right-of-way and on private property for transportation and transportation related facilities; storm drainage facilities;

[25] https://www.islandcountywa.gov/DEM/PLANS/IslandCountyHMP_Vol2_06032020_Draft_Review.pdf

sanitary sewer and water improvements; and park, recreation, and open space facilities. One of the purpose statements for this chapter is to protect life, limb and property form loss and damage by flooding, landscapes, accelerated soil creep, settlement and subsidence, abnormal erosion and other potential natural hazards. The chapter was originally adopted in 1997 with subsequent minor amendments but there are no considerations related to hazards associated with climate change and sea level rise. The Organization for Economic Co-operation and Development (OECD) Sustainable Ocean Economy database highlights data and evidence from international sources to support adaptation planning and recommends that infrastructure safety standards should account for sea-level rise to reduce the associated risks[26].

LMC Building Code Ch. 15.04 – This code establishes and enforces minimum standards of construction, alteration and abatement of buildings and other structures which pose a risk of failure or generally unsafe conditions to the occupants or general public including mechanical, fire and plumbing provisions, within the limits of this municipality. The provisions of this code apply to any structure or part of any structure.

LMC Flood Hazard Ch. 15.24 – The standards in this chapter are to reduce potential flood impacts. It was updated in 2017 to be consistent with the minimum National Flood Insurance Program (NFIP) regulation. As part of the National Flood Insurance Program (NFIP), the Federal Emergency Management Agency (FEMA) provides and periodically updates Flood Insurance Rate Maps (FIRMs) for jurisdictions located within the 100-year, or 1% annual chance floodplain. The City of Langley's FIRMs were last updated in 2017 and provide a relatively clear and current picture of established flood zone boundaries and base flood elevations. As required by FEMA, updated its development regulations using FEMA flood zones and base flood elevations as the basis for development regulations for structural ground floor elevations and flood protections within established floodplains. However, FEMA flood maps are based on historical flooding and do not account for tidal surge, extreme high tides or projected sea level rise. Freeboard of 1 foot is added to provide a factor for safety and to account for uncertainties. One of the recommendations in this Strategy is to amend Ch. 15.24 to increase the required base flood elevation for shoreline properties.

Another recommendation from the OECD database recognizes that building codes and design standards play an important role in making development resilient to predicted SLR impacts through measures such as building elevation, foundation design, moisture entrapment and damage from debris[27].

[26] https://www.oecd.org/stories/ocean/updating-infrastructure-standards-65b91da4

[27] https://www.oecd.org/stories/ocean/incorporating-resilience-to-sea-level-rise-in-urban-building-codes-0808492b

LMC Resource Lands and Environmentally Sensitive (Critical) Areas Management Ch. 16.20 - Standards to preserve and protect resource lands and critical areas as well as standards to protect persons and property from impacts caused by hazards including steep slope failures and flooding. This chapter was originally adopted in 1992 and received some minor amendments. It does not make reference to climate change or sea level rise impacts or mitigation measures. An update of this title is tentatively scheduled to begin in Q1 of 2022 in anticipation of the next periodic update of the Comprehensive Plan. A recommendation in this report is that the future update of Ch. 16.20 an analysis of shoreline bluff erosion and the construction standards for the geological hazard areas be completed to determine the suitability of the existing standards.

All of these local, state and federal regulation work to ensure that development in the shoreline protects ecological functions and public resources. Together with the City's proposed SMP, these regulatory programs would ensure no net loss of ecological functions[28].

Public Consultation

The SMP update began in July 2019 when Council adopted the scope of work and request for proposal for consulting services to prepare the plan update. In this initial staff report staff identified sea level rise as a significant issue that required consideration through this process. The scope of work for the SMP update and the contract identified the intent to discuss in substantive terms SLR in the SMP. This was reviewed by PAB at its 2/5/2020 meeting and approved by Council. A dedicated web page was created for the SMP update at the beginning of the process.
On October 3rd, 2020 we held a community engagement (virtual) event to introduce the SMP update and to talk about sea level rise and what it means for the City. Forty-eight people participated.

The event was interactive and included presentations from:

- Derek Hoshiko is a facilitator, speaker, and organizer based in South Whidbey. He has a background in community-based economic development, local living economies, sustainable local food systems, and the tech sector. He heads Rapid and Just Climate Action, a bold project organizing with communities in Washington State to stop global warming by 2030. He is the primary organizer of the event.
- Swinomish Tribes Shelly Vendiola and Todd Mitchell to hear about the Swinomish community's climate change planning efforts. Shelly is an educator, facilitator, activist and mediator. She is the co-founder native Community Engagement and Peacemaking Project provides facilitation and training in strategic planning, and community engagement. She is also he Communications Facilitator to the Swinomish Climate Change Initiative and the Department of Environmental Protection. Todd Mitchell is the Director of the Swinomish Department of Environmental Protection. As Director, some of his work is as a geologist and indigenous scientist researching the Tribe's water

[28] ESA, 2013

resources including traditional ecological knowledge, tidelands, surface water, groundwater, wetlands, and salmon habitat restoration research.

- Dr. Ian Miller, Coastal Hazard Specialist with Washington Sea Grant, is a scientist, and science communicator. Dr. Ian Miller is Washington Sea Grant's coastal hazards specialist, working out of Peninsula College in Port Angeles and the University of Washington's Olympic Natural Resources Center in Forks. Ian led the development of Washington State's most recent sea level rise assessment. He has authored and co-authored other related publications.
- Nicole Faghin is a Coastal Management Specialist with Washington Sea Grant at the University of Washington. Nicole engages in education, outreach and research focused on social, economic and environmental shoreline issues including coastal adaptation. She manages the planning efforts of a NOAA Coastal Resilience Grant. Nicole holds a master's in city planning and a law degree. Nicole was one of the main event organizers.
- Five local high school youth facilitated the small group sessions where attendees discussed the future flooding potential in the vulnerable areas along the City's shoreline based upon Ian Miller's sea level rise projections for 2050 and 2100.

Attendees were asked to respond to a poll as to whether the City should begin taking adaptation actions for sea level rise impacts. All participants agreed that the City must begin adaptation planning for sea level rise.

The event was widely advertised by directly mailing shoreline property owners; sending an e-newsletter to the Mayor's email list that is made up of over 392 people; and placing posters in community meeting places. The results of the event video and audio recordings as well as a comprehensive resource list from the presenters and attendees are posted on the SMP update web page.

At its regular meeting on December 2, 2020, the Planning Advisory Board (PAB) reviewed and discussed the greenhouse gas scenarios, probabilities and SLR elevations outlined in the Sea Level Rise In Washington State – A 2018 Assessment and in particular the specific work completed for Island County as shown on Table no. 1. The PAB recommended the City base its adaptation planning on the scenario of high emissions and likely or 50% probability to meet or exceed the elevations shown in Table No. 2 below.

	Likely 50% probability
2050	**0.8**
2100	**2.2**

Table no. 2 RCP 8.5 Sea-level Rise Projections Averaged for Island County in feet based on Miller et al projections, as outlined in Island County Shoreline Master Program and Sea-level Rise Workshop, March 19, 2019.

The draft SMP including this document will receive community review as part of the joint public review process. Once a schedule has been confirmed the draft SMP and this assessment will be widely advertised. Shoreline property owners will be directly notified.

Vulnerability Assessment

A community's vulnerability is a function of its exposure and sensitivity to a hazard or environmental change and its adaptive capacity or resilience. Adaptive capacity is a function of local context and refers to a community's ability to adapt to potential impacts, as well as cope with specific events, based on its social, economic and institutional resources. Vulnerability can therefore be reduced by adaptation measures which reduce exposure to (or risks from) a hazard by increasing resilience[29]. Low level areas are more vulnerable to losses from erosion, storms, or flooding. High bluff properties will also be impacted by increasing coastal erosion at the toe of the bluff and increased upland flooding due to changing precipitation events will reduce drainage infiltration capacity potentially decreasing upland bluff stability. Other impacts include loss of habitat and biodiversity and increased saltwater intrusion.

Vulnerability can be lowered by implementing adaptation measures that reduce the risk to the hazard. However, this requires an ongoing adaptive management process to prioritize risks and opportunities. The section below details an inventory of public and private assets located in the shoreline plan area in the context of the figures showing probable sea level rise with storm surge for the 2050 and 2100 time periods.

Residential Uses

Residences on the high bluff properties along the "Langley East" and "Langley West" reaches have been and continue to be remodeled from small older homes to larger single-family homes. The CIA reports that 20 homes are located within 10 to 50 feet from the top of the bluff.

Some of the residential stormwater is not adequately managed and recent incidents of slope failure have been caused by un- or inadequately managed upland drainage. The current SMP regulation 6.8.2.4 requires a drainage study when the increase of impervious area by 200 square feet. This impervious area cap is proposed to be removed and a drainage study is proposed to be required for any development of these high bluff properties.
Many of these high bluff properties are not served by sewer and therefore rely on septic systems. The location of these septic systems for many of these residences is unknown at this time.

For Shoreline Residential properties, Ch. 16.20.045 (C)(a) Geologically hazardous areas establishes a minimum buffer of 50 feet from the top or toe (as applicable) of the slope 15

[29] The Arlington Group, et al. 2013

percent or steeper. An additional 15 feet setback from the edge of the buffer is required for buildings. Table 2 of the SMP established a marine buffer of 15 feet in the Urban Reach.

Appendix Nos. 1 and 2 show sea level rise and storm surge for 2050 and 2100 for the three different reaches. Threats of erosion from sea level rise and storm surge at the toe of the bluffs appear greater in the Langley East reach. Not surprisingly the threat increases for the longer time frame.

The proximity of these existing homes to the top of the bluff, the likelihood that they will be remodeled and potential for erosion at the toe of these bluffs necessitates the City examine the adequacy of these regulations in Ch. 16.20.045. This analysis recommends that a geological and geotechnical analysis of the suitability of the existing geo-hazard setback be completed. This analysis shall consider sea level rise impacts of bluff erosion. detailed assessment related to steep bluffs and toe erosion to inform the Critical Area Ordinance review, scheduled to begin in Q1 2022. The results of this future geotechnical assessment may make recommendations to amend the setbacks established in the SMP but they will remain as outlined in Table 2.

Flooding

Ten residences are located on low bank properties in the West and Central reaches. With the exception of two properties east of Wharf St (Central) they all have some form of bulkhead or seawall, all of different vintages and conditions. Many of these bulkheads were installed over twenty years ago and we can anticipate the need for these to be repaired or replaced to maintain flood protection.

Four of these low bluff residences rely on on-site septic systems. Three are located in “Langley West” reach. Sewer is not expected to serve these properties within any foreseeable time frame. The fourth property in the “Central” reach is located adjacent to the sewer main and is in the process of connecting to sewer.

The three houses located in the ‘Langley West’ reach were built in the mid-sixties, figure 1 shows that the 0.8 ft rise in sea levels is not likely to cause flooding in the 2050 time frame, based upon the 50% probability, except that caused by storm surge. By 2100 the projected sea level of 2.2 feet also does not appear to cause flooding however storm surge will have a much more considerable impact. Proposed policies and regulations in Section 4.4 below would require that any new construction or significant remodel would have to be built an additional 1.2 feet above FEMAs base flood elevation of 18 feet as shown on Appendix No. 4. Also, when any septic system is proposed to be upgraded this development should be required to consider how the system will function when impacted by flooding, either ongoing or intermittent. Given the age of the homes the likelihood that they will be remodeled in the near term is strong.

Vegetation Management

Vegetation management is an ongoing issue along the shoreline as residents and visitors want to maintain views of Saratoga Passage and the mainland. Most residential properties, high and low bluff, have limited vegetation and these areas consist primarily of lawns. Proposed new policies for the SMP update will require planting a strip of native vegetation at the top of the bluff when development is proposed on a property.

Public Infrastructure

The low bank area along the Central Reach contains significant private and public property and infrastructure including the Port of South Whidbey Marina; several residences; Nichols Bros Boat Building satellite dock; two sewer lift stations; a water main; City's Seawall Park; seven stormwater outfalls including Brookhaven Creek, Saratoga Creek. The figures located in Appendix No. 1 identifies many of these assets.

1. Seawall Park

Seawall Park is a 1.44-acre linear park that runs east of the Anthes Street right of way. It is Langley's most revered community park. It was built in 1975 to provide erosion control, bank stabilization, public access and future site for secondary wastewater treatment facilities. City records show the upland was filled in approximately 1947. The construction was permitted under an emergency declaration[30] due to the rate and extent of erosion at the toe of the bluff. The bulkhead was constructed with rip rap at the toe and backfilled. Upland property owners granted quit-claim deeds for portions of their property to enable the construction of the seawall. At the top of the seawall is a strip of land ranging in width from 24 to 56 feet of public and private property. The park offers 1,140 feet of saltwater beach access; views of Saratoga Passage, Camano Island, and the Cascade Mountains; and contains amenities such as totem poles, a walking trail, benches and picnic tables.

Since its construction, a few minor repairs have been made to the seawall. In 2012, the east stairs were repaired because rebar was exposed. In 2014 some minor improvements were made to add park structures. In 2016 Council established the Seawall Park Ad-Hoc Committee to provide recommendations as to how the park could be improved. A survey was completed in 2018. City Council recognizes that the seawall needs an assessment to confirm its long-term stability. The City's Capital Facilities Improvement Plan budgets $75,000 to complete an assessment. A funding source has not been identified.

As shown in Appendix Nos. 1 and 2 for the Central Reach, Seawall park will experience storm surge related flooding by 2100. However, the impacts of sea level rise and related storm surge to the seawall itself is unknown. Public access is therefore likely to be impacted. Policies and

[30] Ordinance 254

regulations outlined below in proposed section 5.1 Shoreline Modification require an analysis of sea level rise and storm surge impacts as part of any remodel of this structure. And proposed section 4.5 Public Access require these sites be elevated by 1.2 feet.

2. Phil Simon Park

This is a 0.46-acre community park that was acquired by the City of Langley in 1975 and transferred to the Port of South Whidbey in 2009. The park is located south east of the marina. It contains benches and picnic tables surrounding by shoreline vegetation. A small low elevation bulkhead is located here.

As shown on Appendix Nos. 1 and 2 for the Central reach, this park will be inundated by flooding in the long term and storm surge will affect it in the 30-year time frame. Policies and regulations outlined below in proposed section 5.1 Shoreline Modification require an analysis of sea level rise and storm surge impacts as part of any remodel of this structure. This analysis shall consider how public access will be impacted and may require the area to be elevated by 1.2 feet as outlined in proposed section 4.5 Public Access.

3. Port of South Whidbey at Langley

In January 2009, the City of Langley transferred ownership of the Langley Marina to the Port of South Whidbey. Marina upgrades were done in 2014. The small boat harbor consists of 41 slips and 330 feet of linear moorage that can accommodate vessels up to 190 feet. Upland facilities include restrooms and showers, water and 110v 20, 30, 50 and 100 amp power at the docks, a floating pump out station and a boat launch. The marina provides transient and permanent moorage. The boat launch is used by many recreational boaters. Remnants from an old commercial pier remain on site.

The Port of South Whidbey prepared a Comprehensive Plan for all their properties that was adopted in 2013. The plan contains policies to maintain and protect waterfront public access and recreational opportunities at the marina in Langley. The Port has future expansion plans for the marina that were originally permitted in 2004 but permits issued by the Army Corps of Engineers have now expired.

As shown on Appendix Nos. 1 and 2 some of marina's upland facilities, boat launch and parking for example, will be impacted by storm surge in the 2050 timeframe. Over the long-term flooding will impact the near shore assets, access dock and boat launch. Storm surges will flood most of the parking area. Public access and use of these facilities will be compromised and proposed policies and regulations to Section 6.4 Boating Facilities requires the Port of South Whidbey to design and construct for sea level rise and requires 1.2 feet increased elevation.

4. Nichols Brothers Boat Building (NBBB)

Nichols Brothers is one of the top ten largest employer in Island County. It is located in the "Center" reach, west of the marina. NBBB builds and repairing ferries, fishing vessels, yachts, and other large vessels. Nichols Bros main facilities are located in Freeland, 10 miles north of their satellite operation in Langley. The Langley facilities are significant because they enable work to be undertaken to vessels on the water and sea trials to be performed. The facilities here consist of a large warehouse building, seawall, docks, and vacant lot used for parking and marshalling. In 2017 the facility received some upgrades to include a new seawall and decking repairs.

As shown on Appendix Nos. 1 and 2, the upland facilities such as the parking area and warehouse building will be impacted by storm surges in the short term. By 2100 these areas will experience some flooding and storm surge will impact areas further inland. Proposed policies outlined below require for any future development that analyses of sea level rise be completed with recommendations for mitigating the impacts.

5. Sewer infrastructure

Key sewer infrastructure is located in the low bank area in the "Central" reach. See Appendix Nos. 1 and 2 for locations. Lift Station no. 1 is located at the toe of Anthes Ave and the Sunrise Beach Pump Station is located further east to Sunrise Lane at the base of Wharf St. There is a permanent generator installed in Lift station no. 1 to be able to operate during power outages. All pump stations are wet well types with submersible pumps and are located below ground except for the control panels that are mounted above ground. 1600 feet of 4 inch sewer force main runs parallel to the shoreline at an approximate elevation of 6 feet. The City's wastewater effluent is discharged through a 12" ductile iron effluent pipe that extends 6,200 feet northward from Lift Station no. 1 at the toe of Anthes Ave.

Mechanical and piping upgrades to both lift stations are identified in the 2015 Sewer System Comprehensive Plan. Sunrise Pump Station was identified as an immediate project in the current 6-year planning window and was scheduled for 2020, but COVID and the demands of the Langley Infrastructure Project, has resulted in a two-year delay. Upgrades to Lift Station no. 1 were identified as a long-term project with a projected implementation in 2034. However, in 2016 a pump failure occurred, and a portion of this project was undertaken as an emergency.

In the short term the Sunrise Ln lift station appears to be impacts by storm surge. Storm surge may be a factor for Lift Station No. 1. However, should the structural integrity of the sea walls be affected these assets will be flooded in the short term.

Future improvements to these assets should consider evaluations for sea level rise mitigation such as flood proofing or relocation. Proposed policies and regulations 6.10 Utilities directs the City to undertake an assessment and to mitigate for future flood impacts.

6. Stormwater Infrastructure

The City has seven stormwater outfalls in addition to Noble and Saratoga Creek that discharge into Puget Sound. All stormwater run-off within the central part of town is routed to the Anthes Avenue storm drain system which receives flows from Brookhaven Creek and the Park Avenue storm drain system. Saratoga Creek discharges directly onto the beach through a 24-inch reinforced concrete culvert pipe. Saratoga Creek flows via pipe under a beach front home and exits to an outfall within a concrete bulkhead.

There are no additional man-made drainage conveyance systems. The 2009 Comprehensive Stormwater Management Plan identifies the need to upgrade some of the outfalls as they are undersized. These outfalls are located at elevations ranging from grade to 3 feet above grade. These assets are located in each of the three reaches and proposed policies and regulations section 6.10 Utilities.

Incorporating SLR into Langley's SMP Update

The following section addresses specific questions raised by DOE staff to address how the assessment fits within the SMP update.

Shoreline Environment Designations and Associated Shoreline Buffers and Setbacks

This analysis does not propose to change the shoreline designations. The proposed amendment to the 2013 designations is administrative and is necessary to address inconsistencies with the upland zoning and the shoreline designation boundaries and between the written description and mapped information. This amendment is outlined in the gap analysis prepared by Watershed Co.

Allowed uses and shoreline modifications are compatible with the identified risks

Section 4.11 Table 1 of the current SMP details the Permitted Shorelines Uses and these uses remain unchanged in the proposed draft SMP. The CIA states that new development opportunities in the City of Langley's shorelines are limited, but redevelopment in the form of remodels and the addition of accessory structures is likely to occur. Since the CIA was completed in 2013 numerous remodels have been completed. As the CIA notes, several homes are within 50 feet of the top of the bluff and property owners are choosing to use the existing building footprint to locate their remodel despite being informed of the risks associated with sea level rise and bluff stability.

This Assessment recommends the addition of policies and regulations to minimize risks.

As discussed above in the section Science of Sea Level Rise and as shown on the maps in Appendix Nos. 1 and 2 there is 50% probability that in thirty years these areas can expect almost one foot of sea level rise and will experience flooding. The added threat of 3 feet of

storm surge will create even greater flooding. This risk can be minimized by requiring new construction or substantial improvements to existing buildings to be built three[31] feet above the existing base flood elevation established by the FEMA Flood Insurance Rate Maps. An additional two feet of elevation is proposed because the lifespans of buildings and structures exceed a 30-year planning horizon[32]. There are numerous examples of buildings in Langley that are well over 80 years old.

SMA Use Priorities

This strategy does not propose to change the primary uses of the Shoreline Management Act (water oriented, public access and ecological restoration). Based on this Assessment the proposed policies outlined below include the requirement for a proponent to complete an analysis as to how sea level rise may impact the proposed use. Recommendations from the required analyses will be conditioned and are expected to result in design modifications to reduce any risks.

Floodplain and SLR risk areas

Special Flood Hazard Areas (SFHA) are delineated on the City's Flood Insurance Rate Maps (FIRMS) created by FEMA. The Flood Insurance Study (FIS) update report provides more detailed information on the existence and severity of flood hazards for the study area. This was updated in 2017 and as required by FEMA the City amended its Flood Hazard Code Ch. 15.24 to be in compliance.

For floodplain management purposes FEMA adopted a national standard for the Base Flood Elevation (BFE), that is the elevation of the 1% annual chance flood or the equivalent of a 100-year flood event. The 0.2% annual chance (500-year) flood is used to indicate additional areas of flood hazard in the community. Flood elevations shown in this FIS Report and on the FIRMs are referenced to NAVD88. The projections detailed in Miller et al (2018) are not tied to any particular datum or baseline. Their assessment is based on the change in absolute and relative sea level over time, which could be applied to any water surface elevation. (pg. 13)

The limit of Zone VE shown on the FIRMs is defined as the farthest inland extent of any of these criterion (determined for the 1% annual chance flood condition).

The flood hazard zones established by FEMA for the City of Langley are Zones VE and AE (see Appendix No. 4). VE is the coastal high hazard area and is one of the highest risk areas shown on FIRMs. Zone VE is designated where wave hazards are expected to be stronger than in other areas and have the potential to cause significant structural damage. Coastal areas designated

[31] This proposed includes the existing one foot above BFE required by FEMA.
[32] The Arlington Group, 2013

as Zone AE are locations that experience lesser wave conditions during storm events, compared to Zone VE, or areas that are well sheltered from waves.

Waterward of the low bluff properties located in the Langley West reach are within the VE Zone and the FIS has established a base flood elevation (BFE) of 21 feet. Upland of the retaining bulkhead is designated as being within the AE zone with a BFE of 16 feet. The low bluff properties located in the Langley Urban reach are within the AE zone the FIS establishes a base flood elevation of 15 feet for this reach.

As shown on the FIRM maps in Appendix No. 3 the low bluff properties located in the City of Langley coincide with areas at high risk of flooding due to sea level rise as shown on the maps in Appendix No. 1. Miller et al (2018) notes that the sea level rise projections established in their research differ from the flood elevations outlined by FEMA because it's based on historical data and assumes there is no long-term change in the flood risk. The flood insurance studies focus on one flood event, the 100-year event, and do not consider the long-term change in sea level that affects the height of surface water at all tidal elevations[33].

To account for sea level rise King County' floodplain development standards (KCC 21A.24.230 to 21A.24.272) require new construction or substantial improvement to existing buildings in the 100-year coastal floodplain to be elevated 3 feet above the BFE identified in the FIRMs. FEMA currently only requires one foot of elevation above the BFE. A FEMA Elevation Certificate completed by a licensed surveyor that shows compliance with the code is required. The proposed draft policies included in this assessment recommend increasing the elevation to three feet above BFE. In addition to amending the SMP, Chapter 15.24 Flood Hazard Areas will also have to be amended.

SMP Comprehensive Update background documents such as the Inventory and Characterization and Cumulative Impacts Analysis

Based on the findings in the Shoreline Inventory and Characterization Report (SIC) (ESA, 2011) and the analysis within the Cumulative Impacts Analysis (CIA), the CIA concluded that "adoption and implementation of the proposed update to the City of Langley's SMP will not result in development that will cumulatively and adversely affect existing shoreline ecological functions."[34]

The CIA states that the process unit from roughly Baby Point to Sandy Point, which includes Langley, was classified as "Least Degraded."[35] This was based upon Puget Sound Nearshore

[33] Miller et al. 2018
[34] ESA 2013
[35] Ibid

Environmental Restoration Project (PSNERP) analysis completed in 2010 as part of the Strategic Needs Assessment Report (SNAR) rated the level of degradation of geomorphic processes in the Puget Sound. However, when looking at Langley's shoreline on its own approximately 50% of the shoreline has been modified according to the CIA.

The CIA contains detailed analyses for the three shoreline reaches. Key management issues are identified for each reach. Sea level rise impacts of increased coastal flooding or accelerated shoreline erosion are identified and noted below.

Langley West - "Potential implications of sea level rise (SLR) and coastal flooding on development within or near coastal floodplain areas (shoreline residential development). (figure 2, CIA)

Langley Central **– "**Potential implications of sea level rise (SLR) and coastal flooding on development within or new coastal floodplain areas (commercial uses and shoreline residential development). (figure 3, CIA)

Langley East – "Potential increases in coastal flooding and rates of bluff erosion due to sea level rise (SLR) or other factors." (figure 4, CIA)

Key management issue dealing with Langley's shoreline ecological functions include the following:

6. Several primary residential structures are located close to the bluff edge, particularly in Langley East. As the bluff retreats due to erosive processes, homeowners may request permits for bank stabilization. Shoreline modification updrift of these shorelines could accelerate erosion, as could sea level rise. Lack of stormwater facilities may also increase soil saturation and accelerate bluff erosion[36].

Section 5.3 of the Restoration Plan for SMP identifies climate change as one of the challenges to implementing the Plan. And recommends the City to keep aware of the implications of climate change related impacts[37]. Both plans state that sea level rise is a management issue. However, except for one policy in the current SMP there is no substantive direction to begin to mitigate these risks. The introduction of the proposed policies and regulations in this assessment begins to recognize these impacts and attempts to minimize the associated risks.

Shoreline Functions

The Restoration Plan states there is a low probability of removing or softening the existing shoreline armoring in the West and Center reaches. In Langley West there is less than 60 feet between the bulkhead and the toe of the bluff. These homes are served by onsite septic

[36] Ibid

[37] ESA 2011

systems and the shared driveway is on the south side of the residences. There is very limited space. The Center reach has similar restrictions but in some locations there is approximately 40 feet of additional lot depth between the existing bulkheads and the toe of the bluff. (Table 4 – RP). The City therefore needs to continue to enable many of these buildings and structures to remain in situ but any redevelopment including bulkhead repairs should be required to adapt to the projected sea level rise as proposed in the draft regulations outlined below.

Vegetation Management
Application of the city's critical areas regulations and SMP provisions to protect shoreline vegetation will help prevent the further alteration of bluff vegetation.

Updated buffer requirements, standards for overwater structures as well as mitigation requirements will likely prevent further alteration of shoreline functions. Updated standards such as softened shoreline armoring and translucent materials on docks may marginally improve conditions over time. It is important to note that these are anticipated developments. No permits applications have been submitted to the City to date. The specific nature of potential impacts cannot be known in detail at this time.

Ecological Function
The CIA states that "risk of impacts to ecological shoreline functions is low throughout the City, because shoreline functions are already highly altered as a result of shoreline stabilization structures and loss of marine riparian vegetation within the shoreline. Therefore, when reasonably foreseeable shoreline developments and potential risks are considered together with the policies and regulations in the Draft SMP and other beneficial plans and programs, cumulative impacts to shoreline ecological functions from those established in the Shoreline Inventory and Characterization Report (ESA, 2010) are anticipated to be negligible." (pg 38, CIA)

Are proposed regulations supported by existing or proposed policies?
The proposed regulations have been established based upon existing and proposed policies found in the SMP and the City's Comprehensive Plan. See Appendix No. 3 for the Comprehensive Plan policies. As noted above, the Comprehensive Plan policies focus on mitigation planning to reduce individual and collective greenhouse gas emissions. But the goal and policy direct the City to begin adaptation planning to reduce and minimize the impacts associated with climate change. The inclusion of proposed policies and regulations regarding sea level rise adaptation is the City's first step in identifying and assessing the associated risks.

Is there a clear link made between the risks identified, the proposed adaptation strategies to address the risks, and the proposed SMP policies and regulations intended to reduce the risks?
The risks associated with increased flooding of low bluff shoreline properties and increased erosion at the toe of high bluff properties projected to occur along Langley's shoreline are well

documented in this assessment and the research used in support of this assessment. The proposed policies and regulations for inclusion into Langley's SMP update are a first step for the City to begin to reduce these associated risks. Additional recommendations are identified in this assessment directing the City to take additional actions following the adoption of the SMP. See below for a complete list of these recommended actions.

Proposed Draft Policies and Regulations

Robust planning for sea-level rise requires a dynamic, forward-looking approach to planning and regulation that explicitly deals with uncertainty to address the changing pace and magnitude of climate impacts. Based upon the analysis provided in this report Langley Planning staff has drafted recommended policies and regulations to the SMP. The draft SMP policies and regulations have been reviewed in context to ensure consistency throughout the Plan.

3.3 Shoreline Environment Designations

3.3.2 Residential

C. Management Policies

ADD 7. Encourage all use and development of shoreline properties to adapt to the potential adverse effects of sea level rise.

3.3.3 Urban

C. Management Policies

ADD 9. Encourage all use and development of shoreline properties to adapt to the potential adverse effects of sea level rise.

3.3.4 Aquatic

C. Management Policies

ADD 10. Encourage all use and development of shoreline properties to adapt to the potential adverse effects of sea level rise.

Ch 4 General Use Policies and Regulations

4.2. Shoreline Use

4.2.1 Policies

ADD 16. The City should continue to develop information about the impacts of sea level rise on the shoreline and other affected properties; the City should develop adaptation plans to address the impacts of sea level rise in collaboration with impacted property owners, the community and the Department of Ecology. These plans should include at minimum flood prevention approaches, shoreline environment impact considerations and financing approaches. The City should amend the Shoreline Master Program and other policy and regulatory tools in the future as necessary to implement these adaptation plans.

ADD 17. During scheduled SMP updates, the City shall assess whether the anticipated SLR projections use in the SMP remain relevant or revisions are necessary to adjust for more up to date research.

4.2.2 Regulations

ADD 14. a. Applicants for development in the shoreline plan area shall be provided with information on sea level rise.

b. Applicants for development in Langley's West and Center reaches shall be encouraged to voluntarily consider increasing setbacks to allow for future sea level rise.
c. A condition of approval for any application, including an exemption letter, shall be required to record a notice on title to identify the potential threat associated with sea level rise and shall hold the City harmless.
d. Geotechnical reports in support of variances proposing development or redevelopment within 65 feet of a bluff must contain erosion projections for 75 years based in part on sea level rise.

4.4 Flood Hazard Management

4.4.1 Policies

ADD 7. Development of properties in the Langley West or Center reaches are encouraged to locate the bottom of a structure's foundation two foot higher than the required elevation established in Ch. 15.24 Flood Hazard Areas.

4.5 Public Access

4.5.2 Regulations

ADD A.9 Public access sites shall be designed to accommodate for the level of expected sea-level rise in 2100. Consideration of sea level rise projections identified in the City of Langley Sea Level Rise Assessment (2021) may be used.

5.1. Shoreline Modification

5.1.1 Policies

ADD 8. Any new shoreline stabilization measure or modifications to existing measures shall consider adaptation to sea-level rise and other climate change impacts to promote resiliency of upland development.

5.1.2 Regulations

ADD 3 b. Partial modification of stabilization measures (fill, construction of protective berms) within the shoreline jurisdiction shall be allowed in response to increases in sea level, subject to all other provisions of the SMP.

ADD 15.i. The size of the shoreline stabilization structure shall be the minimum necessary to protect the primary use or structure. Consideration of sea level rise projections identified in the City of Langley Sea Level Rise Assessment (2021) may be used to determine the minimum necessary size of the shoreline stabilization.

ADD 21.f. The size of the bulkhead shall be the minimum necessary to protect the primary use or structure. Consideration of sea level rise projections identified in the City of Langley Sea Level Rise Assessment (2021) may be used to determine the minimum necessary size of shoreline stabilization structures.

6.4 Boating Facilities (Marinas)

6.4.1 Policies

ADD 18. Marina expansion should be designed and constructed to accommodate for sea level rise to mitigate for the impacts of sea level rise.

6.4.2 Regulations

ADD A.11. Marina expansions shall be designed and constructed to adapt to the level of expected sea-level rise in 2100. Consideration of sea level rise projections identified in the City of Langley Sea Level Rise Assessment (2021) may be used.

6.10 Utilities

6.10.1 Policies

ADD 6. Ensure that new projects for and major maintenance of replacement of utilities and other public infrastructure consider the impacts of sea-level rise in the location, design and operation of the projects.

6.10.2 Regulations

ADD. 12. Upgrades and replacement of utilities and other public infrastructure shall be located outside of areas that may be impacted by the expected sea-level rise in 2100~~, that is 2.2 feet~~ If infeasible, such development shall be designed and constructed to adapt to the level of expected sea-level rise in 2100. Consideration of sea level rise projections identified in the City of Langley Sea Level Rise Assessment (2021) may be used.

Additional Recommendations

In addition to the inclusion of the proposed policies and regulations in the SMP update this assessment recommends the following additional actions be undertaken by the City.

1. Undertake a thorough geological and geotechnical analysis of the suitability of the existing geo-hazard setback is to be completed. This analysis shall consider sea level rise

impacts of bluff erosion. detailed assessment related to steep bluffs and toe erosion to inform the Critical Area Ordinance review, scheduled to begin in Q1 2022.

2. Amend Ch. 15.24. Flood Hazard Areas flood construction elevation be raised two feet above the base flood elevation as established by FEMA's FIRM for new residential (Sec. 15.24.110 A) and non-residential construction (Sec. 15.24.110 B) and substantial improvements. This proposed amendment recommends an additional one foot of elevation above the current standard.

Conclusion

The City of Langley as with all other coastal communities around the globe are beginning to experience sea level rise related impacts of increased flooding, reduced drainage capacity, coastal erosion, changes to coastal habitats, and more frequent and intense storms, storm surge and wave action[38].

The Department of Commerce recommends cities and counties Comprehensive Plan revisions incorporate climate change and SLR adaptation. The City's Comprehensive Plan updated in 2018 directs the City to start adaption planning to improve the City's resiliency to climate change related impacts. The CIA and Restoration Plan prepared in support of Langley's SMP in 2013 identified the impending risks associated with sea level rise. Langley's current SMP contains one policy referencing sea level rise. The Shoreline Master Plan as the guiding document for development activity along Langley's shoreline and this update is an obvious first step for the City to include substantive requirements to minimize the risks of sea level rise for shoreline properties.

Consistent with WAC 173-26-201(2)(a) this assessment uses current and complete scientific and technical information as to how sea level rise is projected to impact Langley's shoreline properties. This research has been undertaken by Washington Sea Grant and UW Climate Impacts Group and is being used by other local governments in their analyses, for example King Co. and the City of Olympia. In addition, this assessment includes research from numerous sources providing guidance for governments around the globe around adaptation planning related to climate change impacts. The mapping in Appendix No. 2 based upon the scientific research noted above clearly shows the impended risks.

The community discussion of sea level rise impacts for the City of Langley started at an event in October 2020. All the participants agreed that the City must begin adaptation planning around the associated risks to sea level rise. The Planning Advisory Board has recommended that the

[38] The Arlington Group et al. 2013

SMP address the risks. Through the public review process for the SMP update Langley Council, property owners and other stakeholders will have the opportunity to provide comments on the draft SMP and this assessment.

As identified in the Restoration Plan prepared by ESA in support of Langley's 2013 SMP "adaptive management is the process of continually improving management policies and practices to respond to results. Shoreline planning is iterative. As data are gathered and compared to past years' data, the City will be able to come to a clearer understanding of environmental processes and stressors. As understanding increases, the City will have the opportunity to adjust policies, regulations, and restoration priorities to adapt to changes in conditions and information.[39]"

[39] ESA 2011

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