

DRAFT MEMORANDUM

Date: March 27, 2023
To: LAND Steering Group
From: Michaela Jellicoe and Bryan Lobel, Community Attributes Inc.
Re: Memorandum #3: DRAFT Chehalis Basin Preliminary LAND Alternative Economic Benefits & Tradeoffs

Economic Benefits & Tradeoffs

This memorandum summarizes potential short- and long-term economic benefits and trade-offs of the Local Action Non-Dam Alternative (LAND) compared to a scenario where the current level of flood reduction activities and investments continue without an increased effort or investment, referred to hereafter in this memo as the No Action scenario. In this case, the No Action scenario does not mean a shift to No Action, rather it describes the scenario in which the Chehalis Basin Board continues investment at the current rate, about \$17 million per year toward flood reduction. Economic benefits include benefits generated by reductions in flood damage, as well as transportation, infrastructure and construction investments. Additional economic development benefits include opportunities for land use and economic redevelopment associated with sending areas and reclaimed land, as well as development of potential receiving areas. Receiving areas are defined as potential locations within urban growth areas (UGA) or local areas of more intense residential development (LAMIRD) that could accommodate additional development relocated from the floodplain, including development capacity assumed for the areas within the floodplain. Sending areas are those areas within the floodplain where relocations are expected to originate from.

Flood Damage Reduction

The Preliminary LAND Alternative aims to reduce both flood depth and extent. Flood protection measures would reduce costs generated through loss of life and damage to structures, property and infrastructure. Investments in levees and a diversion channel protect valuable structures from flooding that remove more than 1,500 structures from the risk of flooding under the Late Century 2080 100-year flood event. The Safe Structures Program (see separate Safe Structures memorandum) would expand the existing Community Flood Assistance & Resilience (CFAR) program and provide opportunities for additional flood damage protection for the remaining impacted structures. The Preliminary LAND Alternative also includes transportation investments. The magnitude and relative extent of benefits generated by the Preliminary LAND Alternative compared to a No Action scenario depends on the following key factors among others:

- The number of structures protected from flood damage from all levels of flooding including catastrophic, major and nuisance flooding.
- The participation rate and number of structures additionally protected through the Safe Structures Program, beyond what is likely to be protected through the existing CFAR program.
- Transportation investments in support of the Preliminary LAND Alternative, and investments that would be made under the No Action scenario that offer flood protection benefits.
- The magnitude of annualized flood damages that accumulate over time and the incremental protection offered by Preliminary LAND Alternative investments, which reduces the accumulation of flood damages.

Annualized flood damage impacts depend on the extent and depth of flooding, and the cumulative magnitude of cumulative flood damages depends on the frequency of catastrophic, major and nuisance flooding. The 2007 flood was the largest on record with damages estimated at \$900 million, according to a report by the William D. Ruckelshaus Center. To date damages from the 2022 flood are estimated at \$12.4 million. The costs of these damages, generally in the form of structure, infrastructure, and property damage, are carried by individual homeowners, businesses, and local and state governments. Incremental benefits through the reduction in damage from smaller flood events can be assumed as levees and the diversion channel are built out over time.

The Safe Structures Program may also increase the number of structures protected prior to infrastructure investments, providing incremental benefits that accrue over time compared to a No Action Scenario. A 2013 study by the State of Washington Military Department estimated that the elevation of 35 homes resulted in \$1.9 million in avoided damage costs during the 2007 flood, compared to the \$1.0 million in costs to elevate the same homes, or about \$25,000 in net benefit per home. The Safe Structures Program provides an opportunity to increase the number of structures protected during a flood event through voluntary protection, elevation and relocation. Depending on the location of structures, as well as the patterns of future flooding, benefits can be realized before completion of key infrastructure components of the Preliminary LAND Alternative.

Incremental protection offered through the Safe Structure Program and progress on infrastructure projects of the Preliminary LAND Alternative would reduce the costs of flood insurance payouts as well as total damages. Between 1978 and 2015, total flood insurance payments through the National Flood Insurance program totaled \$82 million in Chehalis Basin communities, according to the Floodplain Management Master Report. These payments represent just 10-25% of total costs of damage according to the same report. The same report states that properties that experience repetitive loss can be expected to represent 15 to 20% of future flood insurance claim payments. The extent to which voluntary participation in the Safe Structures Program and the Preliminary LAND Alternative infrastructure protect repetitive loss areas may increase the magnitude of flood damage protection benefits.

Incremental progress in flood protection would also decrease the cost of flood insurance premiums for home and property owners, depending on the flood protection measures implemented. Decreases in cost to obtain flood insurance would also increase access to flood insurance for those that were not able to afford insurance.

Housing

Flood protection measures offered through the Preliminary LAND Alternative and the Safe Structures program could lead to increases in property values and housing costs overall. Research has found that the housing market undervalues the risk of flooding in property values. This means that while housing within flood zones is discounted compared to housing outside of flood zones, the discount is not as great as it should be if the risk of flooding was fully accounted for. Flood protection measures may increase the value of newly protected properties and incentivize continued development within those newly protected areas.

Studies have found that housing within flood zones range from 2 to 12.2% lower compared to housing outside of flood zones. According to a study published in *Nature Climate Change*, housing prices within 100-year flood zones tend to be discounted on average by 4.6% compared to housing outside of the flood zone. Another study from the Stanford Woods Institute for the Environment indicates that home values within the floodplain are valued about 2% lower than homes outside the floodplain. A third study from the *Journal of Real Estate Finance and Economics* found that housing prices within the floodplain in the Fargo-Moorhead Metropolitan Statistical Area are 3.5 to 12.2% lower than properties outside the floodplain. This same study also found that a recent major flood event increased the discount by 14 to 16%, but this discount was temporary with property values rebounding over time. Flood protection measures could reduce the level of discount on housing within areas of the Chehalis Basin protected by the Preliminary LAND Alternative.

However, these same studies also find that the housing market undervalues the risk of flooding, including the costs of damages and flood insurance and the increased risk created by climate change. According to these three studies, housing within flood zones are overvalued by 4.7 to 10.6%, indicating that if the housing market fully factored in the costs and risks of flooding, prices would be discounted more than they are currently. The study by the Stanford Woods Institute for the Environment indicates that more information about flood risk and enhanced disclosure requirements could reduce the overvaluation of the housing market in flood prone areas.

Overvaluation in the housing market poses risks to property owners and local governments. Losses in value due to flooding lead to losses in value for property owners. Research has also shown that property value is important for mobility among vulnerable households. Property value serves as collateral for households and increase the possibilities for securing a new mortgage. Losses in value also pose risk to local governments from losses in property tax value. Additionally, overvaluation in the market could incentivize continued development within flood prone areas. (Jordan, 2021 and Husby, 2018)

Research has also shown that building levees for flood protection could lead to an increase in development within newly protected areas. A study by Will Georgic and H. Allen Klaiber shows that new housing development after the construction of the Central and Southern Florida Project levees increased by 57%. This study also examines the longevity of this increase in development and finds that the increased potential for development continues for decades. The literature review in this study indicates that increased development in areas protected by levees could lead to increases in property values that are greater than the level of flood protection offered over the long-term.

The flood protection offered by the Preliminary LAND Alternative's levees and diversion channel could increase the value of housing within protected areas. A 2015 study of commercial property values in Chesterfield, Missouri, after upgrading to a 500-year levee, found that properties protected by a levee do not have a statistically significant difference in price compared to properties outside the floodplain. The study also found that the selling prices of protected commercial properties are higher than those within the floodplain that are not protected. However, the findings on selling prices tend to be statistically insignificant. This study also indicates that there is anecdotal evidence of an increase in supply of commercial properties after levee construction, attributed to agglomeration benefits, or the development of commercial properties attracting additional commercial development. While this study does not examine housing, protection offered by the Preliminary LAND Alternative could result in similar impacts to both residential and nonresidential development types within protected areas.

Housing prices, both the cost to purchase and the cost of rentals have been increasing nationwide and throughout Washington. According to the Washington State Office of Financial Management, median home prices increased 23.9% between 2020 and 2021, and 150.3% between 2011 and 2021 throughout Washington. The Chehalis Basin has experienced this same trend. Median sales prices, based on Redfin data for the primary study area, have increased 9% annually on average between 2012 and 2021.¹ Between 2020 and 2021 the average annual increase in home sales was 17%. Based on Zumper data, average rental rates in Centralia and Chehalis have increased 6-7% between 2015 and 2022. Between 2021 and 2022 average rental rates increased by 7-18%.²

Policies that make building standards more stringent may increase the cost to construct housing. The cost of a slab on grade, according to Forbes is on average \$5 per square foot while the average cost of a crawl space is \$13 per square foot, or an increase in cost of 62%. These cost estimates do not account for the additional cost of elevation beyond the standard crawl space elevation. According to the Building Journal's construction cost estimator, the cost of new residential construction increases 9% between new construction with an unfinished basement compared to new construction with no basement.³

¹ Adjusted for inflation.

² Adjusted for inflation based on rental rates for a 2-bedroom apartment.

³ Construction costs estimates for a 2-story residence with vinyl siding built at economical grade.

Policies that require additional could increase the cost of new home construction as well as the cost of any substantial improvements.

An important contributing factor to rising costs of housing is housing supply. Demand that outpaces supply increases prices. High home sale prices and mortgage rates can lead to home buyers exiting the market, increasing demand for rental housing and thus rental rates. Policy measures that support increases in housing supply may help to decrease the rising cost of housing. Actions that decrease housing supply could exacerbate the existing trend of increasing housing prices.

Transportation

The Preliminary LAND Alternative includes transportation investments to support implementation of levees and a diversion channel. The magnitude and relative extent of transportation benefits generated by the Preliminary LAND Alternative compared to a No Action scenario depends on several factors:

- The design and implementation of each individual transportation project. Benefits derived from these types of projects depend on the design of the project, including the level of safety improvements and whether the project also includes multimodal amenities such as pedestrian, cycling or transit access facilities.
- The magnitude of ongoing flood disruptions and events to the facility.
- Transportation investment decisions that may be made in a No Action scenario and any potential funding tradeoffs required for the Preliminary LAND Alternative that may reduce transportation investments which would otherwise have been implemented.

In general, the Preliminary LAND Alternative improves transportation that may not occur compared to a No Action scenario, assuming minimal funding tradeoffs and increased protection from local transportation disruptions.

Benefits

Potential benefits associated with the Preliminary LAND Alternative include the following.

1. **Travel Time Savings and Vehicle Operating Costs** – The Preliminary LAND Alternative would reduce flooding on local roads, therefore avoiding costs and added time associated with detour routes and increased travel times, changes in trip destination and trips not taken. Additionally, transportation improvements could result in reduced travel times outside of flood protection areas where roads are closed less frequently due to flooding.

The value of travel time, according to the USDOT, ranges between \$16 to \$52 per person per hour, depending on the type of travel. The value of vehicle operation is estimated at \$0.45 to \$0.94 per mile. According to a study by the Washington State Department of Transportation, disruptions to US 12 and SR 6 from the 100-year flood are estimated to result in more than

\$450,000 in travel costs. This estimate excludes the value of disruptions to other local transportation routes and does not capture costs of local road closures and disruptions from small and medium-sized floods.

2. **Safety** – Transportation investments could result in reductions to travel related injuries and fatalities. According to the USDOT, the monetized cost per fatal crash is \$12.8 million, and more than \$300,000 per injury crash. Beyond transportation safety, transportation and other flood protection investments could also result in improved safety overall. The 2022 flood caused the loss of two lives. FEMA’s Benefit Cost Analysis Guidance, values the cost of a fatality at \$5.8 million. Investments in flood protection measures may prevent future loss of life due to flooding.
3. **Reliability** – Transportation improvements, particularly for emergency access and critical infrastructure, could be designed to incorporate best practices in flood management and protection, making it more reliable during major flood events. Increases in reliability and perceived reliability could generate benefits to the region, according to USDOT cost-benefit guidance.
4. **Emissions Reductions** - Reduced vehicle miles traveled due to closures and detours from route improvements may result in emissions reductions.
5. **Facility and Vehicle Amenities** – If designed adequately, there could be an increase in pedestrian, cycling and transit access facilities that would generate economic benefits. Mode switches to active transportation modes such as walking and cycling may also generate health benefits for an active and healthy community.
6. **Emergency Services** - Reductions in flood disruptions and improved transportation infrastructure may result in increased emergency service access and faster response times. Additionally flood protection measures resulting in decreases in flood depths and extents could result in reductions for some types of emergency responses required to respond to flood-related emergencies.

Tradeoffs

The overall net benefit of transportation investments for the Preliminary LAND Alternative depends on the magnitude of potential trade-offs, such as avoided transportation disruptions over time compared to the impact of potential work zone disruptions over time.

1. **Work Zone Disruptions** - Construction of infrastructure required for the Preliminary LAND Alternative will result in transportation disruptions, with direct impacts on existing routes and roadways. These can increase costs associated with travel time, vehicle operating costs, increased vehicle emissions, and slower emergency services and response times.
2. **No Action Scenario Transportation Investments** - Local communities will likely invest in transportation investments with or without the Preliminary LAND Alternative. If these

investments are foregone in favor of flood reduction projects this could offset some benefits of flood reduction related projects.

3. **Agglomeration Benefits** - Connectivity and economic concentration can create positive economic spillovers, and the levees and diversion channel may result in some agglomeration disbenefits through the reduction in connectivity within urban areas.

Direct, Indirect and Induced Economic Impacts

Spending supported by the Preliminary LAND Alternative through construction, engineering, design as well as ongoing operations and maintenance would generate economic benefits to the local community and statewide. These impacts can be quantified in terms of jobs, revenues, and wages. The total economic impacts are the sum of:

- Direct Impacts, or spending generated by the Preliminary LAND Alternative,
- Indirect Impacts, generated through business-to-business transactions, and
- Induced Impacts, created through spending of worker wages.

These impacts can be measured through multipliers, which measure the ratio of total impact to direct impacts, as shown on the chart below. Multipliers include:

- **Total jobs** generated per million dollars in direct output
- **Total employment** generated per direct job
- **Total labor income** generated per dollar of direct output
- **Total output** generated per dollar of direct output

Statewide multipliers for the industries likely to benefit from Preliminary LAND Alternative spending are provided in **Table 1**.

Table 1. Statewide Economic Impact Multipliers

INDUSTRY	TOTAL JOBS	TOTAL EMPLOYMENT	TOTAL OUTPUT	TOTAL LABOR INCOME
Highway, Street and Bridge Construction	3.47	3.01	2.12	0.61
Other Construction	3.95	2.74	2.09	0.58
Architectural, Engineering and Computing Services	6.69	2.19	2.20	0.96
Weighted Average (Low Cost)	4.04	2.84	2.13	0.45
Weighted Average (High Cost)	4.01	2.85	2.13	0.44

Note: Multipliers are sourced from the Washington State Office of Financial Management Input-Output Model.

The increase in spending required by the Preliminary LAND Alternative can be expected to generate economic impacts greater than a No Action scenario. The magnitude of the impact of the Preliminary

LAND Alternative or any individual project will depend on the amount and distribution of spending by industry, as well as any tradeoff in local spending. The localization of the economic impact within each jurisdiction, the Chehalis Basin, or Washington state, depends on where spending occurs. If infrastructure projects or the Safe Structures Program hire local firms with local workers that support local suppliers, the economic impact could be realized within each individual jurisdiction. Alternatively, if out-of-state firms are hired, including workers that live outside of the Basin or Washington, and suppliers who are located outside of the Basin and/or state, the magnitude of local impact will be smaller. Most likely a portion of the labor and equipment required for the Preliminary LAND Alternative will be sourced from local jurisdictions, but local jurisdictions will likely not have sufficient labor and equipment to fully serve the effort. Therefore, a portion of the economic impact will be realized locally, a portion realized elsewhere in Washington and a portion outside of Washington.

Assuming total costs of the Preliminary LAND Alternative is \$1.6 to \$2.2 billion, the total economic impacts to the State of Washington may total between 6,000 and 9,000 total jobs, \$740 to \$990 million in labor income and \$3.5 to \$4.8 billion in total business output.⁴

Economic Development Benefits and Tradeoffs

Additional benefits are generated by reclaiming land through voluntary relocations through Safe Structures Program and the development of receiving areas to serve future growth and relocations outside of the floodplain. Economic development and investments that contribute toward increasing quality of life, such as providing good services, recreational opportunities, cultural access and more are important contributors to a healthy economy. According to the Brookings Institute, “smaller places with a higher quality of life experience both higher employment and population growth than similarly situated communities, including those that rank high by traditional economic competitiveness measures.”

Benefits of Sending Areas and Reclaimed Urban Land

- **Potential for Restored Cultural Site Access or Expansion.** Formerly developed or inundated sites of cultural significance may once again become available to local tribal groups, the community, and others creating a deeper connection to natural resources, culture, and the basin’s history. Such sites may include traditional fishing, hunting, or gathering areas, historic village or camp locations, archeological sites or artifacts, and sites of spiritual or religious significance.
- **Potential Remediation Opportunities.** Formerly residential or mixed-use development located within sending areas may require de-contamination or remediation prior to stabilization or transition to other uses. Such remediation activities may also be subsidized by federal, state, or local authorities and / or non-profit organizations.

⁴ Economic impacts assume a distribution of 68% to 72% of spending within the Highway, Street and Bridge Construction industry; 13% to 17% of spending within the Other Construction industry; and 15% of spending within the Architectural, Engineering and Computing Services industry. Estimates also assume that all spending will occur within Washington.

- **Potential Active Recreational Opportunities.** Recreational amenities, including playfields, ball fields, trails, workout equipment, benches, viewing platforms, picnic areas and shelters, bandshells, and others would be available for use during non-flooding times.
- **Potential Open Space or Passive Recreation Opportunities.** River access would provide opportunities for boating, swimming, fishing, birdwatching, walking / running. Forest, meadow, creek, and other open space areas would provide opportunities for walking, wildlife viewing, picnicking, and play areas.
- **Potential Opportunities for the Agricultural Sector.** Assemblies of fertile former floodplain land that has been remediated or certified contaminate-free has the potential for siting a range of agricultural uses including community gardens, private nurseries, tree-farms; private local, organic gardens or farms.

Receiving Areas

- **Potential Real Estate Market Transaction Opportunities.** Residents using Safe Structures Program would transact new property within receiving areas. Economic benefits related to buying, selling, re-selling, transferring, and insurance of real property would impact real estate agents and other brokers, insurance companies, local taxing entities, and many others.
- **Potential Real Estate Development Opportunities.** A significant potential for long-term economic benefit lies in private and public sector provision of new market-rate and affordable housing and mixed-use development to be built within receiving areas for voluntary relocations under the Safe Structures Program. Wide-ranging beneficiaries would include developers, brokers, material suppliers, builders and tradesmen, insurance companies, local jurisdictions, professional services, and many others.
- **Potential for Enhanced City Housing Supply Opportunities.** New development of housing units of varying typologies and sizes can affect supply and affordability at the scale of the city and region, potentially enhancing the sustainability of city tax and other revenue streams, as well as the perception of the city by private sector businesses considering relocations or expansions.
- **Potential Public & Private Infrastructure Development Opportunities.** Areas identified to receive new growth related to voluntary relocation will require the new provision or expansion of infrastructure including transportation, water, sewer, power, broadband, utilities, and others.
- **Potential Opportunities for Expanded Retail & Service Sales.** Retail will follow residential development - if density is increased incrementally to accommodate relocation plus planned growth, the increased local buying power can support more retail and service activity or stronger sales for local businesses.
- **Potential Opportunities for Other New Business Attraction.** Successful mixed-use, walkable neighborhoods enhance perceptions of quality of life and can attract new talent, entrepreneurship, and business activity.

The relative magnitude of the long-term economic benefits described above may vary depending on final design of the Preliminary LAND Alternative and local participation in the Safe Structures Program.

Tradeoffs with a No Action Scenario

Possible trade-offs when comparing the Preliminary LAND Alternative with a No Action scenario where existing incremental, small-scale interventions are continued may include:

- Reduction of open space and passive recreation opportunities in receiving areas.
- Reduction or alternation of existing agricultural activities in receiving areas if land use protections are not implemented.
- Interruptions to transportation connectivity and commuting by levees and diversion.
- Possible disruption of existing cultural resources depending on placement of infrastructure.
- Disturbance of existing commercial assets and nodes.
- Alteration of proximity patterns of residents to local businesses and / or employers.

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