Recommendations for Integrating Hazard Mitigation and Growth Management Planning in Kitsap County

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Produced by the Institute for Hazard Mitigation Planning and Research

(Sam Ripley - Student Lead,
Jonathan Olds - Researcher, Bob Freitag - PI)

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Executive Summary

This report suggests measures to help Kitsap County better integrate hazard mitigation and growth management planning. The research was performed by the Institute for Hazard Mitigation Planning and Research and funded by the Federal Emergency Management Agency Risk Mapping, Assessment, and Planning (RiskMAP) Program. The intent was to explore ways to integrate the federal hazard risk assessment process with the Washington State's Growth Management Act (GMA) planning mechanisms. This report:

1. Outlines primary planning tools of the GMA and the federal hazard mitigation process
2. Discusses available mechanisms for addressing hazards mitigation and risk reduction planning through Washington's Growth Management Act tools.
3. Presents case examples of best practices for integrating hazard mitigation with growth management in Washington and around the United States
4. Offers recommendations for integrating hazard mitigation and growth management in Kitsap County.

The Washington State GMA promotes coordinated and planned growth while protecting the environment, sustaining economic development, and supporting the health, safety, and high quality of life enjoyed by residents of this state. The GMA accomplishes this through tools for identifying and protecting resources lands and critical areas, establishing urban growth boundaries, and of capital improvement and comprehensive planning. Recognizing that the need for growth planning varies across the state, the requirements of jurisdictions varies across the state based on size and growth rate of the jurisdiction. Kitsap County meets the minimum population GMA threshold to require growth management through Comprehensive Planning, and subsequently a range of

other requirements that support the development and implementation of Comprehensive Plans.[1]

The Federal Emergency Management Agency (FEMA) manages a hazard mitigation program that seeks to help jurisdictions across the U.S. reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities from natural hazards. FEMA's primary tools to reduce the risks from natural hazards include voluntary hazard mitigation plans (HMP) and hazard mitigation grants.[2] To be eligible to compete for the FEMA hazard mitigation grants, local jurisdictions must have an updated and FEMA approved HMP. Kitsap County participates this program.

Both the Kitsap County Comprehensive Plan and Hazard Mitigation Plan support the well-being of the county residents, however each has different regulatory authority and different means of implementation. These differences are illustrated in the purpose statements of each plan. The Kitsap County Comprehensive Plan seeks to manage "use of land and resources to organize and coordinate the complex regulatory and non-regulatory interrelationships among people, land, resources, natural environmental systems, and public facilities to protect and maximize the future health, safety, and welfare of the citizens."[3] The Kitsap County Hazard Mitigation Plan seeks to "…promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from all hazards" by identifying and prioritizing individual mitigation actions.[4] The differences in regulatory authority, intent, and implementation all contribute to difficulties in integrating growth management and hazard mitigation planning. The Growth Management Act and FEMA-guided Hazard Mitigation Plans

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[1] MRSC, Comprehensive Planning/Growth Management. http://mrsc.org/Home/Explore-Topics/Planning/General-Planning-and-Growth-Management/Comprehensive-Planning-Growth-Management.aspx

[2] FEMA, The Stafford Act, 2013. http://www.fema.gov/media-library-data/1383153669955-21f970b19e8eaa67087b7da9f4af706e/stafford_act_booklet_042213_508e.pdf

[3] 2012 Kitsap County Comprehensive Plan, Chapter 1: Introduction. http://www.kitsapgov.com/dcd/community_plan/comp_plan/comp%20plan%20documents/01_Intro%20062112_format.pdf

[4] Kitsap County Multi-Hazard Mitigation Plan. http://www.kitsapdem.org/pdfs/2013%20Mitigation%20Plan.pdf

provide tools for improving human wellbeing. However, greater benefit to the community can be achieved through integrating the two planning mechanisms. This report suggests the following recommendations on how better integration might be achieved:

- **Market-oriented risk reduction opportunities:** Developing a Transfer of Development Rights program that prioritizes moving development out of risk areas and into urban centers with lower risk supports a safer fulfillment of growth goals.
- **Easements that adapt to climate change:** Kitsap County could establish rolling easements along vulnerable coastal properties, supported by clear policy on public use of beaches and waterfronts. Rolling easements are set where the shoreline ends, and adapt as sea level rise pushes the shoreline inland.
- **Use infrastructure as a disincentive growth in risk prone areas:** Capital Improvement Plans (CIP) influence future growth. Involving hazard experts and methods of analysis that account for hazards in CIP development
- **Expanding critical areas to all hazards and opportunities:** Critical Areas are limited to landslide, earthquake and flood. Hazard Mitigation Plans consider all locally relevant hazards when determining risk from the natural environment. It objectives of the GMA and HMP might be better served if the Critical Areas Ordinances could address the full range of potential hazards.
- **Better data capture supports low-risk development:** Data sets that are accurate, frequently updated, and easily accessible enable jurisdictions to more confidently plan for future development. .

Section 1- Background and Context

The Washington State Growth Management Act (GMA) (1990) sets standards and methods for counties and cities to leverage increases in population and development to achieve a more livable environment in the state. The primary goal of the Growth Management Act is to facilitate development without damaging the environment and well being of future generations.

A primary tool for managing growth is the Comprehensive Plan, which sets goals for accommodating growth based on population projections and future needs. (Chapter 36.70A RCW.) The GMA requires that counties and cities protect both the environment from future population increases driving growth, and protect future populations from natural hazards. The GMA utilizes Critical Areas Ordinances to restrict building in environmentally sensitive or hazardous areas and Capital Improvement Plans to budget and prioritize infrastructure projects.

Kitsap County is planning for a population increase of 99,600 by 2025- an increase of nearly 40%. Cities and Urban Growth Areas in Kitsap County have the combined capacity to build enough residential homes for approximately 86,000 people by the year 2035,[5] based on current zoning. Approximately 13,400 more people will need housing, which Kitsap County can accommodate through denser development in urban centers.

Growth management and hazard mitigation processes both aim to increase the well-being of communities by reducing negative interactions between people and the environment. However, the difficulties in integrating hazard mitigation and growth management stem, in part, from each process embracing a different view of the natural world: growth management - where we threaten our natural environment, and hazard

[5] Kitsap County Buildable Lands Report, http://www.kitsapgov.com/dcd/community_plan/blr%202014/documents/Chapter%200%20Executive%20Summary.pdf

mitigation - where the environment poses a threat to us. In addition, disparities exist in how jurisdictions actively plan for growth and how they mitigate risks.

For example, growth management and hazard mitigation both attempt to reduce the impacts of flood hazards. The GMA's intent is to protect floodplain ecosystem services from development, while the HMP goal is to protect development from flood hazards. This is light of our increasing realization that many ecosystem services resulting from frequent flooded areas can reduce risks to built environments.

Hazard mitigation plans follow federal regulations set by the Stafford Act of 1988 and subsequent amendments. Hazard mitigation plans use risk-based assessment to develop risk reduction strategies through mitigation actions. These actions are to protect communities from environmental hazards. Objectives and mitigation actions typically focus on reducing current risks more than risks posed by future growth into hazardous areas. Risks that we pose to ecosystem services are not directly addresses.

In contrast, the Growth Management Act requires jurisdictions to develop Critical Areas Ordinances (CAO) to protect environmentally sensitive areas from development. CAOs in each jurisdiction must: "include the following areas and ecosystems: (a) wetlands; (b) areas with a critical recharging effect on aquifers used for potable water; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas; and (e) geologically hazardous areas."[6] A demonstration of this conflict in focus is apparent in that many communities comply with the Critical Areas Ordinance for frequently flooded areas by merely adopting the National Flood Insurance Program (NFIP) Ordinance and using the NFIP flood hazards maps to define this crucial areas. The NFIP provide little support in protecting and maintaining beneficial ecosystem services. However, communities can set higher standards that further the goals of the GMA for enhancing and protecting the environment. Kitsap County's focus on "frequently flooded area" is largely defined by the NFIP (Kitsap County Critical Areas Ordinance 19.150.355 Frequently Flooded Areas)

[6] RCW 36.70A.030(5) Growth Management Act Definitions

Hazard mitigation plans assess current probability and impacts of hazards on people and infrastructure. The risk assessments conducted in hazard mitigation planning process typically identify particular structures that are vulnerable, which enables jurisdictions to propose specific mitigation projects. However, mitigation on a project-by-project basis typically cannot address all identified risks. Funding is limited, and the scope of work for modifying structures is inefficient compared to building with higher standards from the start. While retroactive hazard mitigation planning may be able to help protect existing buildings and infrastructure, integrating hazard mitigation into existing Growth Management Act's approaches and tools would enable Kitsap County to more safely accommodate new development and redevelopment.

Inclusion of hazard mitigation goals within the Comprehensive Plan goals can support the community's capacity to mitigate, respond and recover from disasters. However, consolidating the hazard mitigation and growth planning processes would more effectively strengthen the resilience of communities in the county. To achieve this consolidation, the differences in growth management and hazard mitigation planning need to be reconciled. The following sections of this report provides an overview of the growth management and hazard mitigation planning frameworks applicable to Kitsap County, presents case studies and best practices for integration, and presents recommendations for integrating the Kitsap County's growth management and hazard mitigation mechanisms.

Section 2- Planning with Washington's Growth Management Act (GMA)

Washington State's Growth Management Act was a response to the impacts of unregulated growth during the 1970s and 80s. Parts of the State experienced rapid growth of low-density development with poor provision of infrastructure and government services. In addition, there was an increase in conversion of farm and forestry lands to residential and urban uses. Much of this growth occurred in western Washington. Kitsap County's population grew by 87% between 1970 and 1990, a rate more than twice the State's average growth rate of 42.6%.[7] By the end of the 1980s, the political discussion shifted to finding mechanisms to protect resource lands, environmentally sensitive areas and for guiding growth and development. Responding to public concerns, the legislature passed Washington State Growth Management Act of 1990.[8]

The Growth Management Act (GMA) established state goals, compliance schedules, set standards and offered guidance for preparation of local comprehensive plans, development regulations and public participation. The GMA requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing long-range plans, and implementing plans through capital investments and development regulations. The GMA seeks to maintain a higher quality of life by preventing the negative effects of sprawl and by ensuring the health of valuable natural resources and farmland.[9] GMA requirements vary among jurisdictions based on county population. Kitsap County meets the minimum population threshold to require Comprehensive

[7] Kitsap County Comprehensive Plan
[8] Sterret, Jill et all. *Planning the Pacific Northwest*. APA Planners Press: City, 2015.
[9] Washington Department of Commerce, Growth Management Laws and Rules. http://www.commerce.wa.gov/Services/localgovernment/GrowthManagement/Pages/LawsRules.aspx

Planning, and subsequently a range of other requirements that support the development and implementation of Comprehensive Plans.[10]

To help identify where hazard mitigation planning can be integrated in GMA planning processes, an overview of three major tools of the GMA, Comprehensive Plans, Critical Areas Ordinances, and Capital Improvement Plans, are presented below.

Comprehensive Plan

Comprehensive Plans are a primary tool for guiding long-range planning for counties and cities. Comprehensive Plans are the product of many sub-planning processes to influence the development of housing, infrastructure, and environmental resources. A Comprehensive Plan provides a guide for development based on 20 year projected population growth and economic trends. Estimates of capacity for new buildings and redevelopment of old structures, as well as environmental limitations also shape development policy. With the establishment of the GMA, legislators enacted formal definitions and requirements for Comprehensive Planning within the state, establishing it as the primary body of regulation that guides land use and infrastructure planning and creates more uniform standards for code development.

Requirement and Eligibility

Nineteen counties in Washington engage in formal Comprehensive Planning processes as a requirement of GMA. Under GMA, Comprehensive Plans must include useable maps of future land use, local objectives, and a description of the public process and amendments used to develop the plan itself.[11] Jurisdictions not required to conduct Comprehensive Planning may develop their own Comprehensive Plans voluntarily. The less populous counties in the state are only required to draft and follow regulations limiting development on critical areas (hazardous or environmentally sensitive lands).

[10] MRSC, Comprehensive Planning/Growth Management. http://mrsc.org/Home/Explore-Topics/Planning/General-Planning-and-Growth-Management/Comprehensive-Planning-Growth-Management.aspx
[11] RCW 36.70a, Comprehensive Plan Mandatory Elements.

Comprehensive Plans must include the following elements at a minimum:

- Land Use
- Utilities
- Economic Development
- Housing
- Transportation
- Parks and Recreation
- Capital Facilities
- Rural (for counties only)

Usage and Implementation

The Comprehensive Plan sets legally enforceable spatial boundaries. Creating firm boundaries allows developers to make confident decisions about what they can build on a given piece of property, and helps planners and community members forecast what communities will change over time. Requiring development actions to meet the goals and established boundaries of a Comprehensive Plan makes plans better predictors of actual growth trends.

Jurisdictions can adopt amendments on an annual basis to accommodate unexpected issues without waiting on a full plan update.

Required elements of the Comprehensive Plan include several functions relevant to reducing the risks associated with natural hazards. For hazard mitigation actions to be a part of GMA amendment processes, jurisdictions would need to review and vote on them to be included more than a year in advance of a hazard event occurring.

Critical Areas Ordinance

The Critical Areas Ordinance (CAO) is the primary GMA tool for protecting environmentally sensitive areas and limiting development on geologically sensitive areas. The Kitsap County Critical Areas Ordinance sets regulatory conditions for building in areas that are environmentally sensitive, and areas subject to landslides,

earthquakes or flooding. Critical Areas Ordinances establish a legal boundary for limiting development through the mapping of critical areas and setting rules for what building types are prohibited in critical areas.

Requirement and Eligibility

The Growth Management Act requires the designation of critical areas and the adoption of development regulations to protect those areas. Critical areas must include landslide, earthquake, and flood hazards, as well as environmentally sensitive areas such as wetlands and aquifer recharge lands.[12] Jurisdictions must use Best Available Science (BAS) to develop CAO regulations. Washington regulations require Best Available Science meet the following criteria:[13]

1. **Peer review.** The information has been critically reviewed by other persons who are qualified scientific experts in that scientific discipline. The proponents of the information have addressed the criticism of the peer reviewers. Publication in a peer-reviewed scientific journal usually indicates that the information has been appropriately peer-reviewed.
2. **Methods.** The methods that were used to obtain the information are clearly stated and able to be replicated. The methods are standardized in the pertinent scientific discipline or, if not, the methods have been appropriately peer-reviewed to assure their reliability and validity.
3. **Logical conclusions and reasonable inferences.** The conclusions presented are based on reasonable assumptions supported by other studies and consistent with the general theory underlying the assumptions. The conclusions are logically and reasonably derived from the assumptions and supported by the data presented. Any gaps in information and inconsistencies with other pertinent scientific information are adequately explained.
4. **Quantitative analysis.** The data have been analyzed using appropriate statistical or quantitative methods.

[12] RCW 36.70A.170(1)(d), Natural resource lands and critical areas- Designations.
[13] WAC 356-195-905. Criteria for determining which information is “best available science.”

5. **Context.** The information is placed in proper context. The assumptions, analytical techniques, data, and conclusions are appropriately framed with respect to the prevailing body of pertinent scientific knowledge.
6. **References.** The assumptions, analytical techniques, and conclusions are well referenced with citations to relevant, credible literature and other pertinent existing information.

Usage and Implementation

Critical Areas Ordinances seek to present coherent and implementable regulation to manage complex environmental systems. The way that wetlands are regulated provides a good explanation of the way regulations classify complex systems.

Kitsap County relies on the Washington State Wetlands Rating System as a means of defining the level of functionality for different categories of wetlands.[14] [15] For example, a category one wetland supports more potential wetland ecosystem functions than does a category four wetland. This rating system classifies all wetlands into four functional categories. Based on the category, the county establishes buffer setbacks for protection and mitigation replacement ratios if impacted. Developers typically are required to hire a wetlands biologist to delineate and rate wetlands on the proposed development property. The county then uses this information to determine what restrictions the critical area will place on the proposed development.

Kitsap County's assessment of hazardous critical areas (Landslide, earthquake and flood) also relies on Best Available Science generated by other agencies. Case-by-case review of hazardous into a highly detailed assessment of Kitsap County's risks is an expensive process. Similar to the implantation of wetlands, Kitsap County implements the mapping and classification of landslide, earthquake and flood hazard critical areas using data from other agencies.

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[14] Kitsap County Critical Areas Ordinance, 2005. http://www.kitsapgov.com/dcd/lu_env/cao/cao.htm
[15] Washington State Wetlands Rating System, 2014 update. http://www.ecy.wa.gov/programs/sea/wetlands/ratingsystems/2014updates.html

Capital Improvement Plan

The Capital Improvement Plan (CIP) is the blue print for funding the maintenance and construction of capital facilities. These include at a minimum, water systems, sanitary sewer systems, storm water facilities, reclaimed water facilities, schools, parks and recreational facilities, police and fire protection facilities.[16] CIPs schedule when jurisdictions build new projects or repair existing infrastructure, and budgets for them using both revenue and financing as needed. CIP's also illustrate how jurisdictions will meet the GMA goal of 'concurrency', ensuring adequate facilities are available when the impacts of development occur, or within a specified time thereafter.[17] The choices made in CIPs have a strong influence on how urban environments change over time.

Requirement and Eligibility

Capital Improvement Plans are a required element of Comprehensive Plans. RCW 36.70a.070 includes a description of what is required in CIP development, stating that required elements include:[18]

1. An inventory of existing capital facilities owned by public entities, showing the locations and capacities of the capital facilities.
2. A forecast of the future needs for such capital facilities.
3. The proposed locations and capacities of expanded or new capital facilities.
4. At least a six-year plan that will finance such capital facilities within projected funding capacities and clearly identifies sources of public money for such purposes.
5. A requirement to reassess the land use element if probable funding falls short of meeting existing needs and to ensure that the land use element, capital facilities plan element, and financing plan within the capital facilities plan element are coordinated and consistent. Park and recreation facilities shall be included in the capital facilities plan element.

[16] WAC 365-196-415. Capital facilities element. http://app.leg.wa.gov/wac/default.aspx?cite=365-196-415
[17] WAC 365-196-840. Concurrency. http://app.leg.wa.gov/wac/default.aspx?cite=365-196-840
[18] RCW 36.70a.070, Comprehensive Plans- Mandatory Elements.

Usage and Implementation

Capital Improvement Plans are highly implementable because of their inclusion of a budget and funding sources, prioritization of when projects will receive funding, and signed approval by leadership. CIPs project a six-year timeline, but are reviewed and updated annually. CIPs are valuable not just as a budgeting tool; they are also important for shaping consensus within a jurisdiction's different departments about infrastructure priorities.

Infrastructure shapes how a community evolves. Public finance and construction of major infrastructure including arterial roads and water mains, lowers private sector development costs. Thus, infrastructure investment is tool that guides growth to desirable areas, while the lack of infrastructure investment can be used as a tool to discourage or minimize growth in non-desirable areas.

The quality and extent of infrastructure development are major factors in determining the necessity of disaster response and recovery. CIPs influence disaster operations in three ways. The first is the effect of adequate infrastructure investment on the ability of responders to quickly access areas impacted by disaster. Well-maintained roads and bridges are critical for moving response resources, as are the level of repair of utilities that responders may need, such as water pipes maintaining fire hydrant pressure. Infrastructure is not limited to just the pipes, wires and roads. Fire stations, emergency medical services and other public health resources are all part of the system of infrastructure found in CIPs.

The second effect of infrastructure on disaster operations relates to how many people are impacted. Infrastructure provides the basic services that communities need to function. If the majority of a jurisdiction's infrastructure remains functional during a disaster, fewer people will need assistance. Homes and businesses that have adequate access to basic services do not need the same level of assistance that displaced populations require. Infrastructure in need of routine repair is already more prone to failure. CIPs that target the repair of aging infrastructure and finance construction in

less hazardous areas are also an investment in response capabilities and ease of recovery.

Thirdly, infrastructure can encourage people to live in vulnerable areas. An improved road to a floodplain may have a significant impact in increase the number of individuals at risk.

Section 3- Hazard Mitigation Plans and RiskMAP

The Stafford Act, signed into federal law in 1998, and as significantly amended in 2000, established the authority for FEMA to develop and implement a disaster hazard mitigation program. The program seeks to help jurisdictions across the U.S. reduce injuries, loss of life, and damage and destruction of property, including damage to critical services and facilities from natural hazards. FEMA's primary tools to reduce the risks from natural hazards include hazard mitigation plans (HMP) and hazard mitigation grants.[19] To be eligible to compete for the FEMA hazard mitigation grants, local jurisdictions must have an updated and FEMA approved HMP.

To support the risk assessment process of HMPs, FEMA has a RiskMAP program that provides local jurisdictions with GIS-based loss estimates of specific hazards. Jurisdictions can use RiskMAP data as a way to prioritize mitigation actions, and to generally gain a better understanding of their potential losses.

Hazard Mitigation Plan

Hazard mitigation plans guide local jurisdictions and state governments to catalog risks and strategize solutions to reduce impacts of emergencies and disasters. Hazard Mitigation Plans combine an inventory of hazards and vulnerabilities with actionable goals to mitigate hazard impacts through structural projects and public information programs. Plans prioritize mitigation projects based on potential impacts and feasibility, and identify possible funding sources. In the process of developing a plan, jurisdictions examine factors such as how often a particular hazard is likely to occur, and the people, property and systems vulnerable to impacts. Analysis includes critical facilities and infrastructure systems, vulnerable populations, transportation and public services.

[19] FEMA, The Stafford Act, 2013. http://www.fema.gov/media-library-data/1383153669955-21f970b19e8eaa67087b7da9f4af706e/stafford_act_booklet_042213_508e.pdf

Requirement and Eligibility

The Stafford Act and amendments define grant incentives for communities that complete Hazard Mitigation Plans.[20] Any local government jurisdiction may complete a Hazard Mitigation Plan that meets FEMA standards. Participating jurisdictions include counties, towns, cities, special purpose districts, tribal governments and states. Approved plans must meet a number of requirements in the Code of Federal Regulations Title 44 Part 201, which are detailed in various guidance documents.[21] All plans must include three basic required elements: planning process, risk assessment, and mitigation strategy. Completed Hazard Mitigation Plans must also include plan review and official adoption by executive leadership.

Planning Process

The FEMA's hazard mitigation planning process requires the following:

- A process for collecting input and involving members of the public, businesses, non-profits, academia, and neighboring jurisdictions.
- Review of existing studies and plans, and a means of incorporating relevant data. This includes other plans within the jurisdiction.
- Documentation of all plan elements.
- Plan for ongoing plan maintenance and review in anticipation of the next 5 year update.

Risk Assessment

Hazard Mitigation Plans must include a risk assessment which describes relevant hazards with information on potential impacts to a community, and how severe those impacts may be. Assessment of hazards should include a history of past occurrences and probability of future events.

[20] FEMA, Integrating Hazard Mitigation, 2013. http://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf
[21] FEMA, Mitigation Planning Laws, Regulations & Guidance, 2015. https://www.fema.gov/mitigation-planning-laws-regulations-guidance

The risk assessment profiles risk using two primary factors:

1. The physical magnitude and probability of hazards likely to affect the planning region, such as extent of floodplains with a 1% chance of occurring annually.
2. Exposure of and potential impacts to people and critical facilities to hazards, such as the number of people and value of infrastructure within a floodplain.

Methods of analyzing hazards differ based on the hazard analyzed and data available. Jurisdictions can analyze earthquakes and floods using HAZUS, a computer program that models how different kinds of building construction perform under the physical forces of hazards. Earthquakes and floods are the only hazards relevant to Kitsap County currently available in HAZUS. Jurisdictions may use GIS mapping without HAZUS to analyze community exposure to other hazards. Maps of the area of impacts overlaid with population and infrastructure data provides a useful baseline for comparing hazards. For example, Wildland-Urban Interface (WUI) areas show where wildfires are most likely to transfer to inhabited spaces. Mapping WUI areas does not model fire behavior in the way that HAZUS models earthquakes or floods, but it does give jurisdictions an important spatial comparison for the hazard. The completed risk assessment should provide clear information that a jurisdiction can use to take action. FEMA's review of risk assessments looks for quality and usefulness, not overall quantity of studies and data sets. Analysis of the physical parameters of hazards by whatever method is useful to inform decision-making.

Mitigation Strategy

Jurisdictions use the risk information from the risk assessment to develop a mitigation strategy and drive the selection of mitigation actions. Mitigation actions include physical modifications to buildings such as seismic retrofits, as well as program-based projects like educational outreach to the public about local hazards. Mitigation actions should be appropriate for the community, but not

limited to immediately attainable projects. Jurisdictions can use existing community needs to prioritize mitigation actions and determine whether they are appropriate.

Part of mitigation strategy development is assessing the capability a jurisdiction has to implement projects. Capabilities include:

- Direct regulatory and taxation authority through municipal codes and police powers
- Voluntary programs for buyouts and retrofits
- Policies directing public funds for mitigation
- Partnerships with businesses, non-profits, and other levels of government

Mitigation actions should include both projects that are fundable with and/or without pre-disaster mitigation grants. A jurisdiction's assessment of internal capabilities should reveal alternative methods of funding. Capital Improvement Plans prioritize funding for repair and replacement of infrastructure. Jurisdictions can cross-reference structural mitigation projects for critical facilities from Capital Improvement Plans, and justifiably use general budget and financing to fund mitigation.

Review, Evaluation and Implementation

Jurisdictions describe how their Hazard Mitigation Plans will be used as living documents and not simply as a federal grant prerequisite. This includes identifying how the plan will be monitored and by whom. Development of the plan requires participants to review what actions they have taken in the last planning cycle and what actions to carry forward in the next cycle. Jurisdictions also review changes in development, budget and local policies in the last planning cycle as a way to assess mitigation priorities.

Plan Adoption

The highest local executive authority within a jurisdiction must officially adopt a final draft plan. Adoption is the final step for federal approval and completion of a Hazard Mitigation Plan. Jurisdictions can submit plans that are otherwise complete but not officially adopted for final FEMA review. Jurisdictions must subsequently adopt within one calendar year of receiving "Approval Pending Adoption" from FEMA.

FEMA guidance allows for flexibility in how jurisdictions address plan components, as long as basic requirements are met. For example, performing public outreach about the plan development is required, but a specific methodology for outreach is not. The most important factor for plan development is that the scale and form fit the community. Small communities may satisfy outreach requirements through town hall meetings, while large cities may develop a multimedia outreach strategy to gain greater coverage.

Usage and Implementation

Funding of mitigation actions is often the single greatest barrier to successful implementation. Jurisdictions may apply for funding through federal grants for disaster mitigation, if they have a current, federally approved Hazard Mitigation Plan. FEMA's hazard mitigation program never intended federal grants to be the sole source for funding hazard mitigation projects.[22] To ensure implementation, mitigation projects identified in Hazard Mitigation Plans should include a diversity of funding sources..

Another challenge to implementation is that Hazard Mitigation Plans are advisory rather than compulsory. Although the plans are officially adopted, there is no guarantee that the plan will be implemented.

Current best practices and federal guidelines for Hazard Mitigation Plan development encourage jurisdictions to research their other land use tools like Critical Areas Ordinances and Building Code that potentially support hazard mitigation actions. This

[22] FEMA, The Stafford Act, 2013. http://www.fema.gov/media-library-data/1383153669955-21f970b19e8eaa67087b7da9f4af706e/stafford_act_booklet_042213_508e.pdf

cross-plan support increases usefulness of Hazard Mitigation Plans, but does not carry the same weight as changes to municipal code or direct inclusion of mitigation actions in the Comprehensive Plan.

Kitsap County has identified a review of identified hazard mitigation projects during the development of local budgets as a goal within the current plan.

RiskMAP Update for Kitsap County

Risk MAP provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. Through more precise flood mapping products, risk assessment tools, and planning and outreach support, Risk MAP strengthens local ability to make informed decisions about reducing risk.[23] The primary tool used for assessing risk is HAZUS, a spatial analysis tool that creates loss estimates for flood for a range of building types. The loss estimates are presented in a Risk Report.

The Risk Report also identifies Areas of Mitigation Interest where jurisdictions may choose to focus hazard mitigation investment. Jurisdictions that use updated RiskMAP findings to create risk-based policies for land use and building codes can increase resilience as a regular part of development, instead of as a reaction to hazard events.

FEMA's RiskMAP program most recent update to the Risk Mapping Assessment and Planning (RiskMAP) program for the Kitsap region contains risk assessment information for Bainbridge, Bremerton, Port Gamble S'Klallam Indian Reservation, Port Madison Indian Reservation, Port Orchard, Poulsbo, and Unincorporated Kitsap County. The intent of RiskMAP is to both analyze and inform communities of their hazard risks, and to provide pathways to action for reducing those risks.[24]

[23] FEMA, What is Risk Map? (2012). https://www.fema.gov/media-library/assets/documents/18274
[24] FEMA RiskMAP Kitsap County Risk Report, 2014

Loss estimates for cities on the Kitsap peninsula and Unincorporated Kitsap County show frequent but lower impact from flooding, and a very low frequency but severe impact from earthquakes. The total estimated losses for a 1% annual probability flood event in Kitsap County are $31.7 million. The total loss for a magnitude 7.2 earthquake on the Seattle fault totals $9.7 billion. Because HAZUS does not directly model tsunamis or landslides, FEMA incorporated a narrative description of the tsunami and landslide risk within the county.

Section 4- Review of Best Practices in Incorporating Mitigation and Growth Planning

States manage the challenges of growth in different ways and with different laws. The Growth Management Act is a uniquely as comprehensive piece of legislation when compared to many other states. Much of the published literature about hazard mitigation best practices highlights work of jurisdictions outside of Washington. What follows is a synthesis of best practices in the U.S., with notes regarding relevance to Washington's GMA.

Environmental Policies and CIP Transparency- Skagit County, Washington

Skagit County's 2007 Comprehensive Plan update uses hazard mitigation-oriented policy goals to create long range planning expectations around the avoidance of development in dangerous areas. Skagit County's plan goals state explicitly that development must consider the hazards identified within the Critical Areas Ordinance. The Skagit County Comprehensive Plan's environment section contains clear examples of development policy:[25]

> Land uses that are incompatible with critical areas shall be discouraged.
>
> - Frequently Flooded Areas:
> - Low intensity land use activities such as agricultural, forestry, and recreational land uses should be encouraged in floodplain areas and other land uses in these areas should be discouraged.
> - Land uses, densities, and development activities in the floodplain and coastal high hazard areas should be limited to protect public health, safety, and welfare, to minimize expenditure of public

[25] Skagit County 2007 Comprehensive Plan, Environment section. http://www.skagitcounty.net/PlanningAndPermit/Documents/CompPlan2010/13%20CH-05-el-0508.pdf

money and costly flood control projects, and to maintain hydrologic systems.

- Geologically Hazardous Areas:
    - Low land use densities and intensities or open space shall be preferred in geologically hazardous areas where this practice can provide site specific mitigation.
    - Land use regulations and practices for geologically hazardous areas shall be established so that development does not cause or exacerbate natural processes that endanger lives, property, infrastructure, and resources on or off site.

Including policies hazard mitigation within the Comprehensive Plan and Critical Areas Ordinance, Skagit County has given regulatory strength to the policies. Not only does this establish development expectations, but it also put's the county in a more defensible position if policies are challenged by development interests in the future.

Also noteworthy was that the Skagit County CIP was written as an easily understood transparent document with a public audience in mind, effectively communicating the goals and priorities for development in Skagit's capital facilities funding.[26] This probably contributed to more affective plan implementation. Skagit's CIP report makes it easier for people to gain insight into what can be a complicated process by breaking things down into the kinds of questions people are likely to ask, such as why a particular expenditure is needed and how it will be funded. The report effectively defines what capital facilities are, summarizes how priorities are established, and explains how Skagit County officials use the CIP.

[26] Skagit County 2015-2020 Capital Facilities Plan. http://www.skagitcounty.net/PlanningAndPermit/Documents/CFP/CFP2015.pdf

Gorst Watershed Protection Zone- Kitsap County, Washington

The Gorst Subarea Plan is an example of how subarea planning can recognize a dynamic natural environment and land characteristics, rather than one based solely on what is already platted regardless of the land's dynamics. The plan relies on scientific analysis of the local water flow and habitat through a Watershed Characterization Study to inform future land use development. Kitsap County used the study to determine the relative value of water flow processes, water quality, and habitat within the Gorst Creek Watershed. Kitsap County created groupings that identify zones for restoration, protection, and development based on assessment results for individual water flow components (delivery, storage, recharge, and discharge) and sediment process, as well as habit functions, assessment units (AUs).[27]

The methods used for Gorst are notable because they incorporate environmental dynamics. The primary functional elements of the Gorst analysis are watershed characteristics such as water flow, however the use of primary environmental characteristics could also include other characteristics directly associated with hazards. Just as the way that rainfall collects in creek basins is an environmental dynamic, the same is true of the physical forces of hazards. RCW 90.82 includes guidance on watershed-oriented planning intended to be both thorough in the inventory of watershed function as well as inclusive of local residents in how water resources are used.[28] GMA is explicit in that protecting water resources is a critical component of long-range planning, though RCW 90.82 provides a complimentary but separate set of definitions on watershed planning. Planning for the Gorst subarea with watersheds dynamics fits the intent of both bodies of legislation.

[27] Kitsap County, Gorst Subarea Plan, 2013. http://kitsapgov.com/dcd/community_plan/subareas/gorst/preferred/Gorst_Subarea_Plan_Preferred_2013_0926_maps[1].pdf

[28] RCW 90.82- Watershed Planning.

Rolling Coastal Easements, South Carolina

South Carolina's Beach Front Management Act of 1988 introduced a flexible land use strategy in coastal areas, including rolling easements. This Act established rolling easements as a conditions for managing property that takes into account changes in the exposure the property as related to the mean high tide...[29] They do this by shifting the easement demarcation line as the shoreline changes

In South Carolina beachfront communities, courts found that designating a specific shoreline setback lowered property values. As an alternative, legislators drafted a rolling easement to limit property use and accommodate risks as changes occurred. The conditions of the rolling easement allow property owners to undertake "soft" strategies in protecting their homes, such as beach nourishment, construction of dunes, and sandbagging during storms. Coastal rolling easements prohibit hard measures like seawalls and beach armoring. Property owners can make full use of their land until coastal storms significantly alter the shoreline. If rising sea levels or severe storms push the average tide line further inland, then the rolling easement adjusts to the new tide line. Submerged land seaward of the tide, is usable, but not as a building site.

Rolling easements attempt to accommodate the reality of changing shorelines, and that property owners have invested time and money into fair use of their land. South Carolina's rolling easement regulation is more likely to be successful than a direct easement because it does not present a legal 'taking', and because the regulation gives property owners a reasonable amount of time to adapt their use of the land.

Planning for Climate Impacts, Miami-Dade County, Florida

Climate impacts are an immediate threat for Miami-Dade County. Because Miami-Dade and much of southeast Florida is at sea level, communities are a risk from wind and tidal surge, longer-term stresses to infrastructure caused by saltwater intrusion, and a rising groundwater table. Similar to the range of hazard impacts,

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[29] Louisiana Resiliency Assistance Program, South Carolina Rolling Easements. http://resiliency.lsu.edu/planning/south-carolina-rolling-easements-utilizing-undeveloped-lands-for-flood-mitigation/

Miami-Dade County collaborated with the National Oceanographic and Atmospheric Administration (NOAA) Coastal Services Center to develop and host a “Roadmap” workshop with community stakeholders to help them look at climate change in a different way. As a result of the Roadmap workshop, Miami-Dade officials found that meeting the diverse range of values in the County could be accommodated by putting a “hazards and climate lens” on the issues that residents already cared about. By talking about water use and infrastructure repair in a context that acknowledged how climate change impacts community access to utility services and transportation, officials found that the public support greater than an approach that discussed climate impacts without local context.[30]

Part of Miami-Dade County’s success of integrating planning for impacts from climate change with community interests came from getting decision makers to understand and comment on the data generated through a countywide risk assessment. This was part of an overall strategy of strong leadership in climate adaptation planning.[31] Use of well-organized data and GIS mapping allowed better visualization of how climate change and other hazards could affect the Miami-Dade region. For example, GIS mapping of infrastructure and the extent of hazards decision makers a clearer picture of what could potentially happen in the future. Decision makers can then communicate priorities of government and match them with priorities of residents. Miami-Dade County’s process produced other positive results. Community outreach done as part of the integration of climate impacts and community interests also identified previously unknown vulnerable populations, creating better avenues of communication and knowledge sharing between diverse communities.

[30]FEMA, Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials, 2013. http://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf section 5-3

[31] Miami-Dade County, Miami-Dade County Climate Action Plan. http://www.miamidade.gov/greenprint/pdf/climate_action_plan.pdf

Hillsborough County Disaster Redevelopment Plan- Hillsborough County, Florida

Hillsborough's Post Disaster Redevelopment Plan (PDRP) is an appendix to the Comprehensive Plan

The Hillsborough County PDRP is also notable in that it established Priority Redevelopment Areas located outside of the higher risk areas and in its consideration of using Transfer of Development Rights (TDR). Hillsborough County has not yet implemented the TDR work suggested in the recovery plan, but it is worth examining because of Hillsborough County's seeks to manage risk through redirecting growth to safer locations. Hillsborough County's framework states that TDR should be used to move density from high-risk areas that have been damaged by disasters and are expected to be damaged in future events to more sustainable areas. Hillsborough County designated high-hazard areas as sending areas, and chose receiving areas that are both low-risk for hazards and viable for development regardless of disaster. Hillsborough County performed assessments of housing stock, buildable land capacity, infrastructure investment and risk for receiving areas, incorporating receiving areas within Comprehensive Plan identified economic revitalization and infrastructure investment areas.

Hillsborough County also acknowledges that new strategies need ongoing assessment and modification to be successful. The PDRP states that as "...strategies are tested and mature, [TDR] may be revisited to perhaps pair the voluntary programs' compensation options with some regulatory measures to more aggressively address highly vulnerable development, especially in light of the threat of sea level rise."[32] Hillsborough County expects that public outreach is necessary to make land transfers successful, and recommends partnerships between technical experts outreach to communities to accomplish this.

[32] Hillsborough County, Hillsborough County Post Disaster Redevelopment Plan, 2010

Section 5- Recommended Strategies and Tools for Implementation

The following recommendations provide opportunities for Kitsap County to strengthen mitigation along with the growth management planning process. The recommendations below are formulated from best practices, planning and risk research, and discussion among colleagues.

Rolling easements

Constitutional takings issues are a critical concern in many land use decisions. Standard land use easements are an effective method of preserving shoreline health and public access to beaches, but they may also trigger a taking challenge. Rolling easements are a more refined method of allowing property owners the full use of their land as currently zoned, while allowing changes to shorelines driven by climate change to drive changes in land use over time.

Rolling easements are an ideal tool to mitigate the effects of coastal inundation. Sea level rise is a particularly difficult hazard to plan for; a large body of scientific study shows that sea level rise is happening, but it does not pinpoint exactly how quickly seas are rising or how that rate will change over time. Instead of trying to use modeled projections to create immediate changes to property or monitoring sea level rise along Kitsap County shorelines, rolling easements work with the gradual change in sea level to dictate where the shoreline is as it changes, at the same rate it is changing. Under a rolling easement regulation designed to adapt use of a changing shore, ‘hard’ mitigations along the coastline (seawalls, armoring) that interfere with beach migration would be banned. ‘Soft’ mitigations are an allowable form of protection. Soft mitigations include beach nourishment, construction of dunes, and restoration of salt marshes, as well as temporary measures like sandbagging during storms. Rolling easements would move inland with sea level changes allowing property owners to accommodate changes incrementally.

Coastal processes like shoreline erosion or tidal surge from major storms do not affect all properties equally, and sea level rise is not a uniform process that shifts all water upward at an equal rate. Because shorelines change at different rates, Kitsap County would not need to enact all rolling easements simultaneously over the entire coastline. Kitsap County can begin with areas with the highest level of estimated sea level rise and coastal flooding modeled by RiskMAP.

Additionally, two major state-level protections of shorelines can support the use of rolling easements. The first is Public Nuisance Law, which states that "to obstruct or impede, without legal authority, the passage of any river, harbor, or collection of water" is grounds for public nuisance.[33] The second protection is the Public Trust Doctrine. The purpose of the Public Trust Doctrine is to ensure that "…the waters of the state are a public resource owned by and available to all citizens equally for navigation, commerce, fishing, recreation, and similar uses."[34] The United States Supreme Court has affirmed the use of the Public Trust Doctrine as a generally valid concept, with the caveat that states have the right to interpret the specifics of its applications. In Washington, the court system has not yet rigorously tested Public Nuisance Law and Public Trust Doctrine as they apply to climate change, but the concepts should be considered as a source of support for rolling easements. Sea level rise continuously redefines where the tidal line is, and thus access according to tenants of fair public use described in the Public Nuisance Law and Public Trust Doctrine.

The RiskMAP update for Kitsap County contains valuable data highlighting areas most likely to benefit from enacting a rolling easement. RiskMAP data indicates areas within coastal inundation zones categorized by the probability of a significant flood event. The modeling does not directly account for sea level rise, but this is not necessary in order to establish good pilot candidates for rolling easements. Shoreline properties already within coastal flood hazard areas are likely to be among the properties that experience

[33] RCW 7.48.140- Public Nuisance.
[34] Erin Crissman-Glass, Legal Implications of Sea-Level Rise. http://cses.washington.edu/cig/files/waccia/chrismanglassfinaldraft.pdf

sea level rise impacts. The RiskMAP risk assessment show obvious clusters of buildings within coastal flood hazard areas. Rolling easement pilot projects could target clusters of at-risk homes because:

- Clusters represent greater densities of population. Reducing risk to entire clusters will likely reduce response and recovery needs to entire neighborhoods, allowing Kitsap County to better allocate resources.
- Rolling easements prevent hard mitigation that may benefit one property owner at the expense of neighbors such as jetties and seawalls. Clusters share the benefits of soft mitigation and restoration of other ecosystem services that mitigate coastal flooding.
- Clusters as pilot areas allows Kitsap County staff to target outreach to more tightly grouped communities.

Overlaying Kitsap County unincorporated lands, coastal flood hazard zones, and data points of at-risk buildings identifies ideal clusters for implementing rolling easement pilot projects. The total estimated building loss for a 1% annual chance flood in unincorporated Kitsap County is $31.7 million. Buildings within clusters range in severity of loss estimates. Kitsap County should select clusters based on density of cluster. Unincorporated County near Point No Point is the densest cluster outside of incorporated cities. The Point No Point cluster includes 70 properties within the flood hazard zone, with a total estimated building loss of $1,968,435 dollars for a 1% annual chance flood event. The average loss estimate for buildings in this cluster is $28,120

dollars and the maximum is $101,056 dollars.

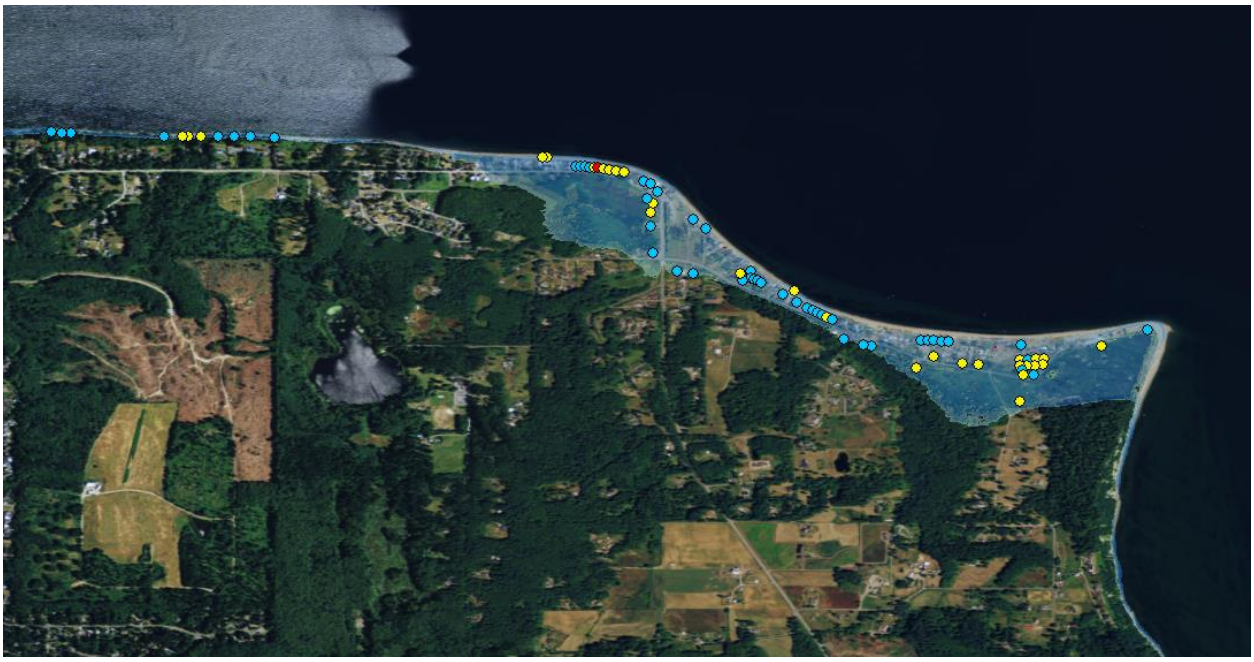


Figure 1- Example of cluster near Point No Point in north Kitsap County. Blue points represent low loss estimates, yellow mid-range, and red high. Transparent blue shading represents flood hazard area. (Full map in Annex)

While rolling easements should explicitly forbid hard mitigations such as seawalls, they are viable because they allow for property uses to change in step with the actual effects of storms and tides. This benefits property owners by giving them time to adapt their use of the land to permanent changes in the environment over time. Real time adjustment of easements also helps to avoid Kitsap County falsely predicting where, when, and how natural changes will occur by enacting easements that take effect immediately.

Transfer of Development Rights

Protecting the economic value of property rights while simultaneously moving towards safer development patterns requires cooperation from property owners and government. The use of Transfer of Development Rights is a viable solution for property owners to maintain their investment without allowing more development in hazardous areas. Transfer of Development Rights (TDR) programs are a market-oriented and government-facilitated solution between willing buyer and willing seller, with the government acting as an intermediary. Other jurisdictions in Washington and around the

country have built out a TDR program as a means to preserve open space, agricultural land, and other natural resources. For example, a farmer might sell their right to subdivide and develop their land as a means to generate value that exceeds the income generated by agricultural production. The right to develop at a certain density of housing units per acre, for instance could be placed into a land bank by the local government. These development rights can then be bought by developers who could then add extra height or density above zoning limits in an already developed area. Jurisdictions can use their Comprehensive Plans as a guide to designate the selling (sending) and buying (receiving) areas so that the exchange acts in accordance with plans for growth. In the example above, the total increase of housing units that the farmer could have built is the same, but by adding them as an incentive to build in an already dense area, developers can achieve a better profit by building in existing urban centers.

Preservation of open space through TDR is also effective as a means to reduce exposure to hazards. For example, by transferring development rights in high-risk flood plain to an area with low risk, more open space in the flood plain is preserved without a loss of net loss in development. Kitsap County Code includes provisions for establishing TDR, including the requirement that usage of TDR is consistent with the direction of the Comprehensive Plan.[35] Although Kitsap County has defined TDR in development code, usage of the tool has been limited.

Kitsap County should consider a number of changes to existing TDR code to ensure that the potential benefits translate to practical gains. Sending areas are at present defined openly enough that hazardous areas could be considered, but a code change to include specific mention of hazardous areas as a viable choice as sending areas would greatly enhance the chances that TDR can be used specifically as a mitigation measure. Receiving areas are currently required to be in Urban Growth Areas (UGA), and code language in Kitsap County Code chapter 17.510 indicates that TDR occur in areas "...not limited by significant critical areas, and no significant adverse impacts to

[35] Kitsap County Code, Chapter 17, Transfer of Development Rights. http://www.codepublishing.com/wa/kitsapcounty/html/kitsap17/Kitsap17430.html

the surrounding properties would occur." This language does in general include hazards as consideration for TDR, but a further amendment to code should be included stipulating that receiving areas within the UGA explicitly exclude hazardous areas as viable areas for development. Soils prone to liquefaction, flooding, and slope hazards do occur within some of the Kitsap UGA, and should be explicitly excluded as receiving areas. Code changes should also exclude coastal properties prone to sea level rise as receiving areas.

Kitsap County should use risk data combined with Comprehensive Plan land use maps as a siting tool for locating sending and receiving areas. Kitsap County could select a short list of possible sending areas from properties with high risk and low intensity land use, and receiving areas selected from areas with low risk and high intensity land use. Unlike flooding or other more localized hazards, the entire Kitsap Peninsula is vulnerable to earthquakes. Areas closer to fault lines and property built on hillsides or on top of loosely consolidated soils are the most vulnerable, but there is no part of the peninsula without some degree of risk. Because of this pervasive risk, TDR programs in Kitsap County should combine retreat from high-risk areas with redevelopment of unsafe structures in receiving areas. The Silverdale UGA is a viable choice for receiving pilot TDR density increases because it combines a risk-based need with an opportunity for implementing Comprehensive Plan goals for density and economic vitality. Silverdale is a census-designated place, meaning that it has a similar urban fabric to a small city, but is not incorporated. Sending areas could be drawn from nearby unincorporated Kitsap County zoned for Rural Protection (less than 1 unit per 10 acres) with high geologic risk. The Silverdale UGA includes zoning for high-intensity commercial and mixed-use development. RiskMAP earthquake loss estimates indicate 227 structures within the high-intensity use area with loss estimates greater than 50 percent of the structures value, mostly centered near the Kitsap Mall. All of these structures are low rise, either one or two stories, and all but one are reinforced concrete frames. While reinforced concrete is in general superior in seismic safety to unreinforced masonry or tilt up concrete, reinforced concrete still varies in performance depending on specifics of construction. Modern reinforced concrete frames deform

rather than collapse, but are not designed to remain habitable post-earthquake. The Kitsap Mall area is a commercial center for the Silverdale UGA; ensuring that buildings remain safe to use after an earthquake is an important step towards securing economic stability and avoiding loss of displaced businesses post-disaster.

Figure 2- Silverdale is a possible pilot location for Transfer of Development Rights that combine risk reduction with existing Comprehensive Plan goals. Green overlay indicates possible sending areas (areas high geologic risk with low development intensity) in unincorporated Kitsap County. Blue overlay indicates possible receiving areas (areas with low geologic risk and high intensity commercial and mixed-use zoning) in the Silverdale Urban Growth Area. (Full map in Annex)

Kitsap County can encourage redevelopment of structures to incorporate greater density by sending unit density rights from other areas, but must include a higher standard of earthquake design. Incentivizing redevelopment of older reinforced concrete frames without higher design standards potentially shifts residents from one hazardous area to another. Aligning RiskMAP assessment data with Comprehensive Plan density goals is an opportunity for Kitsap County to facilitate safe increases to density in the Silverdale UGA.

Figure 3- The portion of the Silverdale UGA zoned for high-intensity commercial and mixed use (blue shade) is currently underdeveloped. Red circles indicate high loss ratio estimates buildings, all of which are reinforced concrete frames not designed to be habitable after earthquakes. Redevelopment supported by TDR to higher density and higher earthquake building standards protects the economic vitality of the UGA as a commercial center. (Full map in Annex)

Kitsap County may face a hurdle in using TDR because of an inconsistency in the code. 17.430 specifies that TDR is necessary to complete a rezone request that asks for increased density above the zoned limit. Unfortunately, Chapter 17.510 (Changes to Zones, Rezones, Amendments, Alterations) was repealed in 2008. This leaves a critical gap in code clarity, and implies that Kitsap County can only use TDR for the purposes of increased density through a Comprehensive Plan amendment. Plan amendments are an important tool for Kitsap County and other jurisdictions to make limited modifications

in order to keep up with unforeseen circumstances or changing priorities, but relying on plan amendments may mean that TDR must compete with other amendment measures.

Capital Improvement Plan Development Team Representation

Often the direct physical hazard is not what impacts survivors most. Rather, the danger is the resulting lack of access to life sustaining infrastructure such as electricity and clean water. Communities build and maintain their infrastructure using the Capital Improvement Plan (CIP), and much of their infrastructural vulnerabilities are the result of choices in capital outlay. While some of the requirement language set forth by GMA for developing Capital Improvement Plans is straightforward, the final contents of a CIP are highly influenced by who is involved in draft development and project selection. This includes either the inclusion or lack of representation from staff that understand and can provide context on hazards or emergency response. A CIP development team that incorporates multiple representatives for a jurisdiction's interest can better account for all needs, as opposed to inadvertently favoring one sector because of disproportionate representation. Once CIPs are established and adopted into a jurisdiction's official budget, it is difficult to make changes in the short term, and even more difficult to make changes after a project is completed. Changes still happen because of unforeseen issues in contracting and construction, but better oversight going into a project reduces unexpected complications. Redevelopment of old infrastructure is a part of growth management. Aging facilities need maintenance and eventual replacement in order to maintain public safety and efficiency of infrastructure systems. The same value for investment is lacking when officials chose to build in an overtly hazardous area to begin with; a mistake cast in concrete is costly in terms of financial resources, and costlier still for a jurisdiction's credibility if citizens view projects as failures.

Including planners and emergency managers in CIP development and using assessment tools that shift project selection priority away from infrastructure in hazardous areas means less infrastructure is exposed to risk. CIP development teams should have representation from staff members and experts who understand the hazards and how emergency responders make use of infrastructure during disasters. One possible method to assist in balancing project priorities is to use a system of multi

criteria analysis that factors in hazards as an innate part of budgeting. Capital projects are expensive and intended to last a long time. If a final CIP does not account for hazards, then ultimately it is incentivizing unsafe development and potentially wasting money by requiring costly mitigation or reconstruction after the fact.

Rethinking the Role of the Critical Areas Ordinance and risk assessment.

Critical Areas Ordinances (CAOs) are intended to prevent human activity from impacting ecologically significant systems, and likewise to prevent humans from being impacted by natural hazards. The rationale for these protections is clear: building in certain areas harms the health of either people or the environment. Distinguishing interactions as either negative for humans or negative for ecology helps make regulations clear and enforceable by drawing discrete lines, but it does not adequately account for the complexity of human-natural systems nor their potential for benefits if managed well.

The physical layout of a landscape strongly influences the dynamics of a system, whether it is human or natural. Street grids influence traffic, and topography influences stream flow. Current CAOs recognize many of these dynamics only as they relate to the limited range of hazards and ecosystem functions within the regulation. For instance: steep slopes are more prone to erosion and landslide, open fields transport rainfall into groundwater tables better than paved streets, and loose soils are prone to liquefaction during earthquakes. These are the clear dynamics that CAOs successfully integrate as regulation. While regulating impacts from those dynamics that are currently included in CAOs has helped prevent development in unsafe areas or development that would negatively impact sensitive ecologies, Kitsap County could increase benefits by enacting two major changes.

The first change is to expand the definition of critical areas to reflect Best Available Science (BAS) on the full range of ecosystem services and risk reducing ability of many of these services. The use of valid and up-to-date analysis of hazards fits succinctly with the GMA mandate that jurisdictions use Best Available Science (BAS) as a fundamental part of plan development. The precedent for BAS in growth management

often derives from studies of habitat and water quality, but expanding BAS to include more hazard science is equally important. Kitsap County can begin with a more robust inclusion of Best Available Science for hazards, similar to the use of ecological science for wetlands critical areas. This will require more resources to study the hazards of Kitsap County, but is still significantly less expensive than increasing case-by-case analysis of proposed development sites.

Kitsap County can improve CAO by opting to include all hazards identified through the development of the Kitsap County Hazard Mitigation Plan's Hazard Identification and Vulnerability Analysis. The risk assessment within the Kitsap County Hazard Mitigation Plan already contains assessment and mapping of landslides, floods and earthquakes, the three hazards found in the Kitsap Critical Areas Ordinance. Although the statutory requirements differ between HIVA and CAO, both map the extent of hazardous areas. For the Kitsap Critical Areas Ordinance to be comprehensive in mapping all local hazards, CAO maps should include the same hazards identified in the HIVA,risk assessment and more specifically those hazards included in RiskMAP. The 2014 RiskMAP Risk Report for Kitsap County contains hazard and loss analysis useful for guiding policy and selecting mitigation projects. The loss tables for housing stock in cities and unincorporated areas contained within the report are an excellent tool for comparing and validating Kitsap County's current CAO maps. Wetlands mapped within the CAO overlap with the area of 1% annual probability coastal flooding mapped by FEMA in the RiskMAP report, but the CAO maps do not include loss estimations for buildings already within flood plains.

The second change is to treat natural recourse areas as another form of capital, in the same way that built infrastructure is considered capital. Risk analyses should addresses vulnerabilities to at risk ecosystem services as they currently research our built environment.

The health of ecological systems such as wetlands and forests feeds into to the health of nearby communities. Ecosystems provide many of the same services as built

infrastructure. Wetlands improve water and air quality, provide space for recreation, and protection from flood hazards. Current CAOs help to meet these service needs by limiting development impacts in ecosystems or directly limiting proximity to hazards; an ecosystem services framework expands the assessment of functions to the full range of positive and negative impacts that changes to land use might have. In the case of developing a wetland, the current regulations are in place to prevent one party benefiting from development while ecosystem services are diminished for all others benefitting from a functioning wetland.

Kitsap County planning for the Gorst Urban Growth Area already includes flooding issues. The approved Gorst Subarea Plan includes proposed projects and total expenditures for transportation, drainage, habitat and sewage improvements. Storm water drainage and fish habitat improvements target a number of properties with a history of flooding.[36] Kitsap County should consider additional improvements in the area just west of the coastal wetlands shown in figure 4. Flood impacts in the area include sinkholes, water quality concerns, drainage problems and flooding over roadways. Instead of pumping and concrete storm water drainage pipes, Kitsap County could use bioswales to decrease flooding. Bioswales are a form of storm water conveyance that use permeable surfaces and plants to absorb storm water and remove pollutants. Well-designed bioswales save repair costs over time because they are low maintenance.

A single bioswale is unlikely to contribute significant ecosystem services, but larger connected networks of bioswales may support water quality and flood improvements in addition to habitat. Improvements to wetlands along the shore and estuary connecting to Gorst Creek can provide water quality improvements to creek outflow, and healthier habitat for wildlife. Improved recreation opportunities in the form of better fishing may follow. The Gorst Subarea Plan includes capital outlay for regional trail improvements. Improving natural capital can also contribute an aesthetic to nearby bike and pedestrian trails, particularly along the proposed trail following the coastline and coastal wetlands.

[36] Kitsap County Gorst Subarea Plan, 2013. http://www.kitsapgov.com/dcd/community_plan/subareas/gorst/final/Gorst_Final_Capital_Facilities.pdf

Combining points of green infrastructure into a more comprehensive network supports multiple Comprehensive Plan goals to improve environmental quality, as well as secondarily supporting better nonmotorized transportation options.

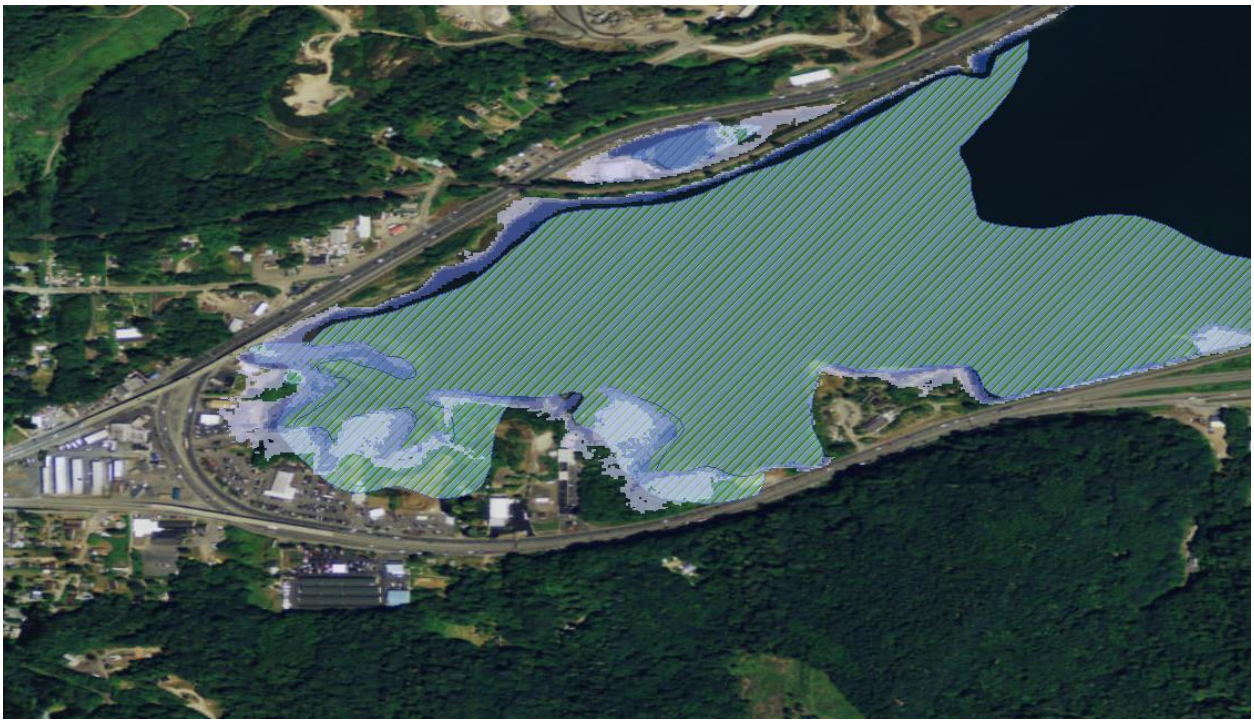


Figure 4- Kitsap County could alleviate flooding issues at the outflow of Gorst Creek by including improvements to wetlands and natural drainages in the Capital Improvement Plan. 'Green infrastructure' such as bioswales and restoration of wetlands improve drainage and add floodwater storage capacity. Blue-white gradient show FEMA flood estimates, pin stripes show extent of wetlands designated in the Kitsap County Critical Areas Ordinance. (Full map in Annex)

Expanding Data Management and GIS Coverage

Accurate data about the built environment is an essential part of managing development. Confidence in the age and condition of infrastructure and housing is vital for jurisdictions to make good decisions about capital investment, and one way to make sure that information is available is to maintain a comprehensive database of building stock. Good data management benefits more than just the routine maintenance of infrastructure. Keeping detailed records of the layout and age of infrastructure also enables a powerful comparison to the extent of hazards. When using programs like

HAZUS or other modeling programs that utilize specific attributes in a GIS based dataset, the outputs are highly limited by the inputs. The level of detail and accuracy captured in decadal census updates is not sufficient for a reliable in-depth analysis. Using basic datasets without checking accuracy or adding initially excluded data points often conveys false expectations.

Modeling is not an absolute predictor of the future, but rather a guideline that helps set reasonable expectations and highlights what areas need further study. Using data that accurately captures real world conditions increases the reliability of modeled projections. Kitsap County can significantly improve the usefulness and ease of access for any analysis of the built environment by standardizing the data collection, formatting all newly permitted construction, and conducting a reassessment of existing construction records to create a dataset of all buildings in Kitsap County, with accurate, standardized and useful information.

The following is a sample of data requirements for buildings based on those used in HAZUS, but much more could be included. Basic fields should include:

- Facility name or indication of building type (such as Kitsap County Administration Building, or simply Private Residence for a home.)
- Facility owner
- Address in separate fields
    - Street address
    - City
    - Zip code
- Latitude and Longitude in separate fields. (The coordinate point should be approximately the center of building, but estimates of coordinates from satellite maps are sufficiently accurate.)
- Number of stories
- Replacement Cost (in thousands of dollars)
- Year built

- Year upgraded (Primarily for substantial upgrades such as a seismic retrofit or foundation work. This can be complicated for large buildings like hospitals, which in many cases are renovated wing by wing. In those cases, a separate entry for each major change would be useful- such as Hospital name: renovation to wing name.)
- HAZUS Earthquake and Flood codes. (These are specific codes used by HAZUS. Getting the correct designations can be complicated, and will likely require participation by GIS and building officials in data categorization, but having the data will yield much higher loss estimates.)
    - EQ Design Level
    - EQ Earthquake Building Type
    - EQ Foundation Type
    - EQ Landslide Susceptibility
    - EQ Soil Type
    - EQ Water Depth in Meters between 0-1000
    - FL Average height of electrical equipment
    - FL Flood Structure Foundation Type
    - FL Protection in terms of return period
    - FL Utility Damage Function Indicator
    - FL Utility Indicator

Capturing information on existing infrastructure is difficult because much of it is underground. The condition of a piece of infrastructure can either be estimated based on date constructed (information that is not always available) or from inspections. The costs these inspection merely to catalog infrastructure may be prohibitive, but jurisdictions can add a relatively small cost by surveying infrastructure whenever repairs are already being done, or when new infrastructure is installed. Changes such as adding a certain length of new pipe of a certain width and material should then be submitted with beginning and ending GPS coordinates to be edited in Kitsap County GIS shape files. For instance, if a 300 foot long section of 12 inch galvanized steel pipe is installed, that can be added as a line segment on a map file, with the metadata about

dimensions, materials used and date installed. The hazard loss estimates and completed GIS products furnished to jurisdictions through RiskMAP updates can then be used for other assessment of hazard exposure, and how land uses may need to be changed. In addition to helping planners locate viable areas to implement pilot mitigation/growth management integration projects, jurisdictions should use RiskMAP data as part of developing future land use maps.

Although data management is not a requirement of GMA, it is fundamental to actually executing long range planning with a higher degree of confidence. Most of the recommendations made within this document rely on queryable GIS inventories, and ensuring that they are accurate to begin with lends that accuracy to all of the applications that require GIS.

Section 6- Conclusion and Next Steps

Adopting the recommendations contained within this report can play a significant role in Kitsap County's future efforts to grow in a disaster-resilient manner. Similar to the individual mitigation actions of a Hazard Mitigation Plan, or the line items in a Capital Improvement Plan, these recommendations are not stand-alone endeavors. They are part of a bigger strategy, and Kitsap County will be more successful in implementation by considering recommendations in a broader context.

Managing the growth of Kitsap County in a way that accounts for hazards and reduces vulnerability is a complex task, and one that will require refinement and course-correction as time goes on. Kitsap County, like other jurisdictions, faces the challenge of balancing community vision for a vibrant future with the realities of a finite budget and availability of staff. The ideas for discussion within this report act as jumping-off points, not an explicit prescription for Kitsap residents. Kitsap County should first engage members of the public to promote the possible benefits of integrating hazard mitigation into growth management. Kitsap County should include these ideas for review and comment as part of public outreach. Creating a dialogue with residents will help Kitsap County better identify public priorities and support for new policies and programs.

Kitsap County could start with internal review of ideas to strengthen local context, followed by an initial open meeting for public comment. Following an initial meeting, Kitsap County could consider a series of more focused meetings to smaller community groups. Integrating mitigation and growth planning is likely to be more successful with a long-term program. Risks are built over time. Reducing those risks and making communities safer from hazards will also take time, but doing so through community-informed planning can help Kitsap County achieve sustained and disaster resilient growth well into the future.

Appendix- Loss tables and maps

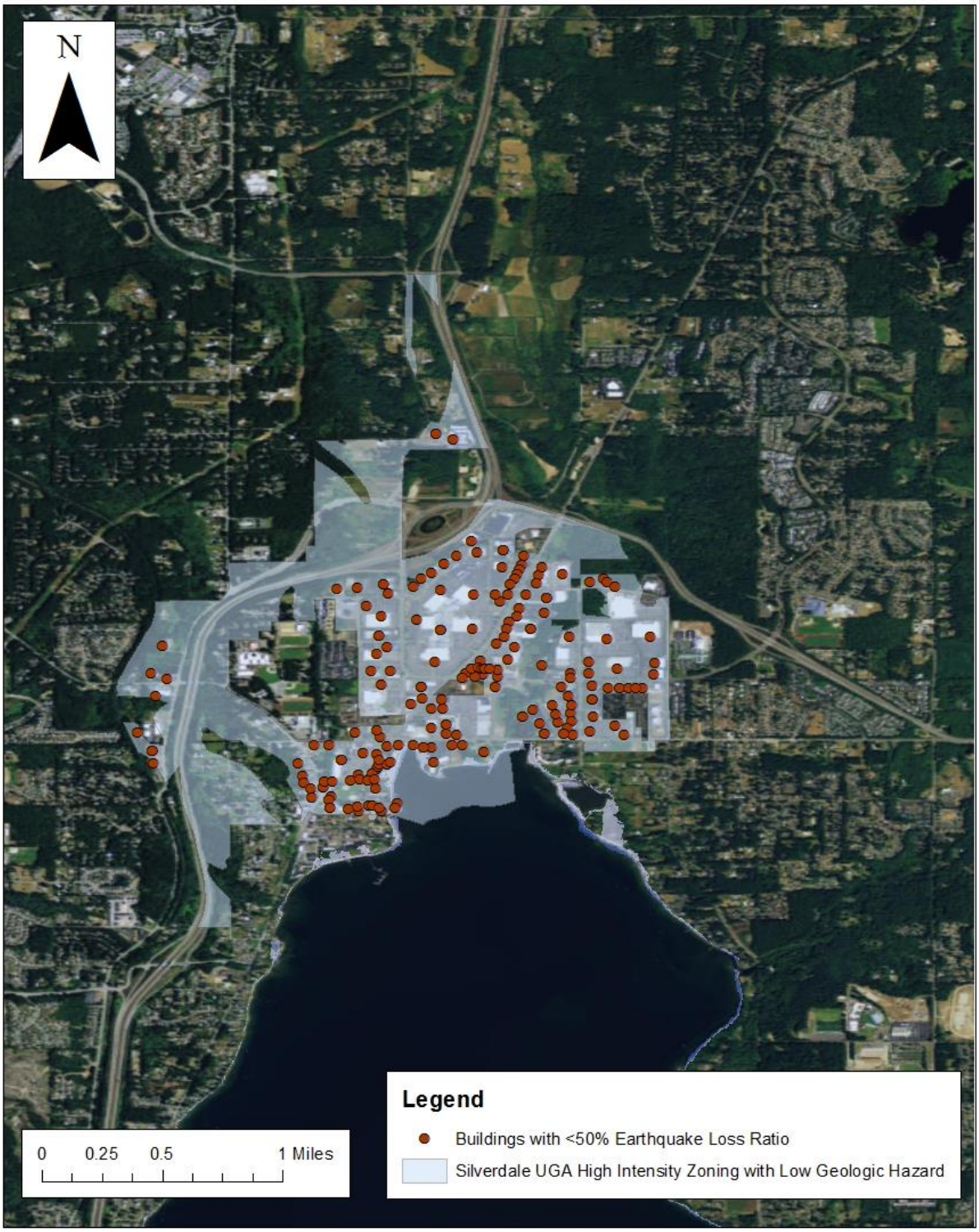
Table 1- Kitsap County RiskMAP Risk Report estimated flood losses in Kitsap County.

Community	Total Estimated Building Value	Percent of Buildings in the Special Flood Hazard Area	Building Dollar Loss for a 1% Annual Chance Flood Event	Loss Ratio (Dollar Losses/Total Building Value)	Number of Buildings within the AE, A zones	Number of Buildings within the VE zones
Bainbridge	$364 Million	3%	$5.4 Million	1.5%	893	36
Bremerton	$92.7 Million	1%	$8.2 Million	8.8%	312	0
Port Gamble S'Klallam Indian Reservation	$0	0%	$0	0%	0	0
Port Madison Indian Reservation	$785,000	<1%	$11,600	1.5%	3	0
Port Orchard	$32.5 Million	1%	$298,000	1%	56	0
Poulsbo	$22.3 Million	1%	$740,000	3.3%	35	0
Unincorporated County	$579 Million	2%	$17.1 Million	3%	1,946	182
Total	**$1 Billion**	**2%**	**$31.7 Million**	**2.9%**	**3,245**	**218**

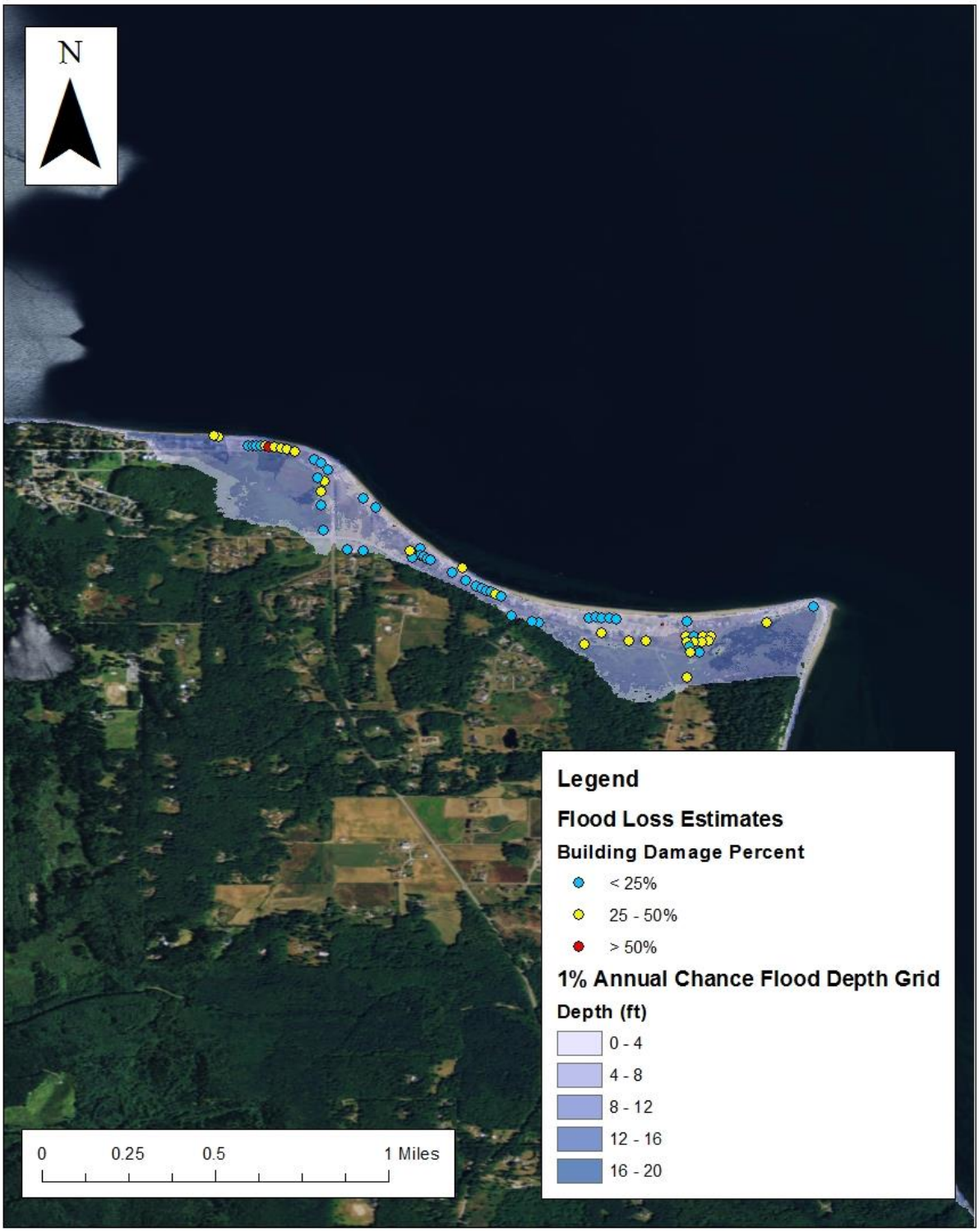
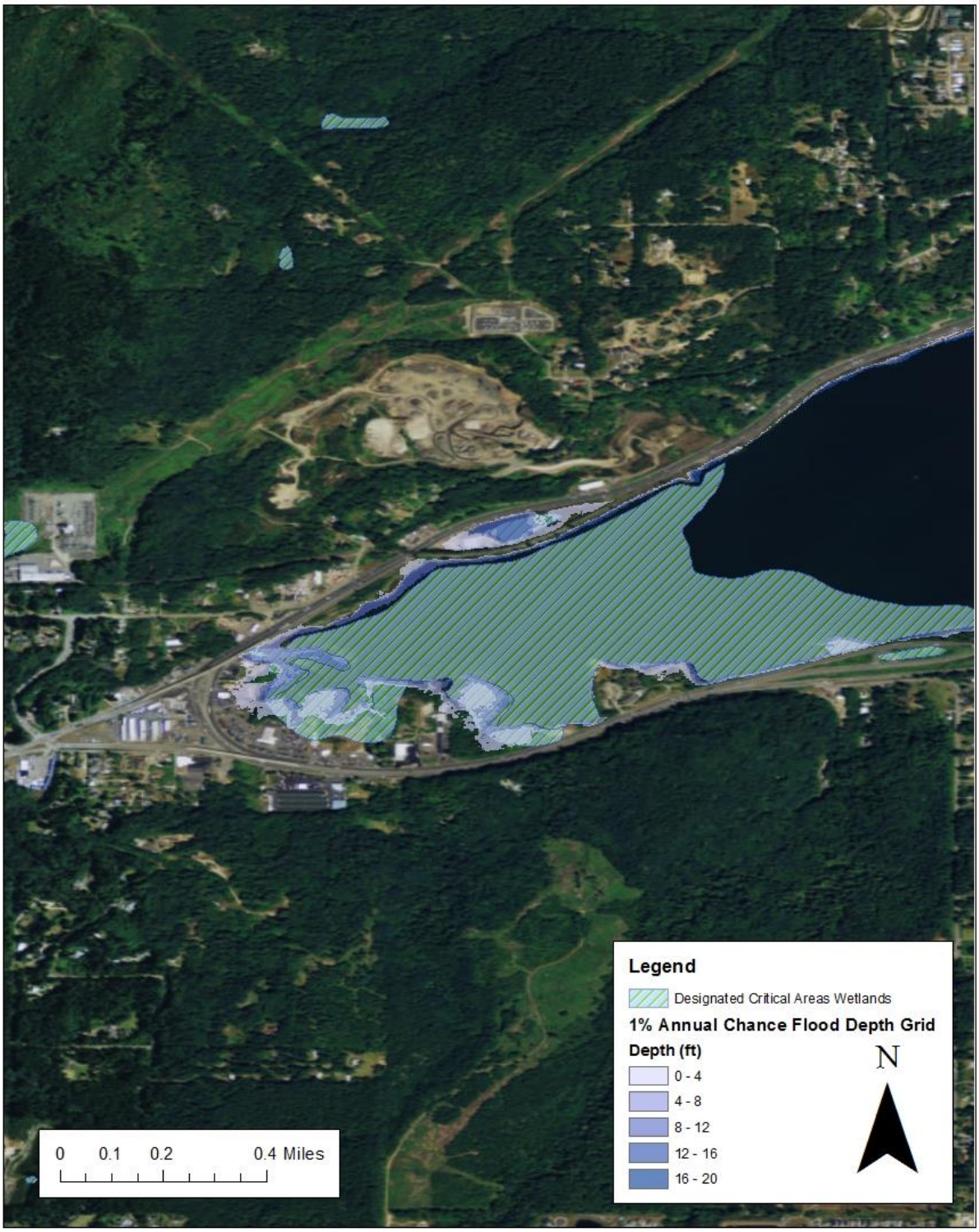
Table 2- Kitsap County RiskMAP Risk Report estimated earthquake losses in Kitsap County, based on a MW 7.2 earthquake along the Seattle fault.

Community	Total Estimated Building Value	Total Number of Buildings	Number of Buildings in the Moderate – High Liquefaction Zone	Percent of Buildings in the Moderate-High Liquefaction Zone	Building Dollar Loss for a Seattle 7.2 Event	Loss Ratio (Dollar Losses/Total Building Value)
Bainbridge	$3 Billion	8,642	919	11%	$846 Million	28%
Bremerton	$3.3 Billion	10,617	300	3%	$1.16 Billion	35%
Port Gamble S'Klallam Indian Reservation	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Port Madison Indian Reservation	$629 Million	2,997	94	3%	$109 Million	17%
Port Orchard	$1.2 Billion	2,590	142	6%	$374 Million	31%
Poulsbo	$1.1 Billion	2,563	64	3%	$122 Million	11%
Unincorporated County	$15.3 Billion	62,104	3,226	5%	$7.1 Billion	46%
Total	**$18.7 Billion**	**89,513**	**4,745**		**$9.7 Billion**	

Properties for Redevelopment in the Silverdale UGA Using Transfer of Development Rights



Property Cluster near Point No Point for Pilot Rolling Easement Implementation



Coastal Wetlands and Flooding in the Gorst Subarea