Environment Appendix

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Greenhouse Gas Emissions

Greenhouse gas emissions consideration is relatively new concept for the City of Bremerton to be planning for. Along with the hiring of a consulting firm to assist us with the Comprehensive Plan Update, the request was made to provide the City some additional information that may help formulate specific strategies that can be considered and deliberated in the upcoming planning horizon. The following is further information for the City to consider to later adoption (or amending of existing code).

Greenhouse gas (GHG) emission reduction strategies identify ways in which federal, state, and local governments can assess greenhouse gas contributions and set priorities to reduce fossil fuel dependence and the potential negative impacts of climate change. The main way local governments can reduce emissions is by encouraging and incentivizing more sustainable behavior among residents. As part of the Comprehensive Plan Update, Bremerton is required to review and update policies related to sustainability and climate change.

This describes the sustainability and climate change requirements from the state and the Puget Sound Regional Council (PSRC). It also describes a range of sustainability strategies that could be adopted by City of Bremerton to reduce GHG emissions. The primary focus is to quantify their likely effectiveness, estimate their costs of implementation, and assess their feasibility and appropriateness in Bremerton.

Background

GHG emissions in Washington come from transportation (46%), electricity (20%), industrial sources (16%), residential and commercial buildings (9%), agriculture (6%) and waste (3%)[1]. To reduce emissions in Washington, the state has adopted legislation that sets emission reduction targets to:

- Return to 1990 levels by 2020
- Reduce emissions to 25% below 1990 levels, by 2035
- Reduce emissions to 50% below 1990 levels, by 2050[2]

These goals above are statewide reduction goals, across all sectors and sources of emissions. While these goals are enacted in state law, the state has not yet assigned targets for the regions of the state, nor for individual sectors (transportation, energy, housing, etc.) The federal government has also not yet set national GHG reduction goals, and current federal legislation being considered by Congress would require specific state goals and targets at least 2 years beyond the enactment of federal legislation. In the absence of specific requirements and guidance, the Puget Sound Regional Council (PSRC) Transportation Policy Board has taken a proactive stance to address the state's climate change goals in the Transportation 2040 Update process.[3]

[1] http://www.ecy.wa.gov/climatechange/laws.htm
[2] RCW 70.235.020
[3] PSRC, Transportation 2040

Bremerton has already taken steps to address climate change by joining more than a dozen other cities across the region in signing the U.S. Mayors Climate Protection Agreement. This initiative is supported by several sustainability actions Bremerton is engaging in citywide including:

- Performing energy efficiency audits on City owned buildings and facilities
- Working with Puget Sound Energy to retrofit City buildings
- Replacing City traffic lights with LED
- Encouraging City employees to find alternatives to driving alone and reduce emissions through their participation in the Commuter Trip Reduction Program
- Investing over $10 million in nonmotorized improvements over the past five years

It is important to note that some GHG reduction strategies can only be implemented at the state and federal level. Examples of these larger-scale actions that are currently under debate and that Bremerton can support include:

- Adopting stricter fuel economy standards
- Implementing market based approaches that put a price on carbon such as cap-and-trade and a carbon tax
- Updating commercial and residential energy building codes and standards, as well as appliance and equipment energy conservation standards to be more energy efficient

Actions to Reduce GHG Emissions

Potential Strategies

The following section identifies a range of sustainability strategies that Bremerton could use to reduce GHG emissions in the transportation, energy, and waste sectors. The strategies are grouped by three alternatives. Each alternative is modeled off of a low, medium, and high target scenario. Although the state has set statewide reduction goals across all sectors and sources of emissions, there are currently no assigned targets regionally. *As a result, at this time PSRC does not require greenhouse gas reduction strategy implementation or target setting, thus this information is provided to set the context for conversations in the next planning cycle when this will likely be required to be implemented.* The establishment of any target would go beyond what is required by law and would show Bremerton's commitment to sustainability.

A library of strategies to reduce GHG emissions can be found in the tables following this section.

Low Target Scenario

A low target scenario assumes a GHG reduction of 1-5 percent from existing conditions. This level of reduction can be achieved by adopting a relatively simple and low cost sustainability strategy that reduces vehicle miles travelled (VMT) by five percent per capita, reduces solid waste by five percent per capita, and support energy efficient retrofits of existing buildings through low loan or grant programs.

To reduce vehicle miles travelled by five percent, Bremerton could adopt policies that increase land use diversity where possible, and invest in bicycle, pedestrian, and transit infrastructure. Having different types of land use near one another can decrease VMT as trips between land use types are shorter and may be accommodated by non-auto modes of transport. The difficulties of implementing these policies and strategies can range depending on public resistance to land use and zoning changes and non-auto oriented improvements. However, these strategies can achieve a combined VMT reduction of up to 5 percent (with minimal implementation difficulties and low costs) or 12 percent (with greater implementation difficulties and costs).

Medium Target Scenario

A medium target scenario assumes a target reduction goal of 6-10 percent. To achieve this level, Bremerton could adopt a sustainability strategy similar to the preferred alternative within the PSIC-Bremerton Subarea Plan[4], in addition to the requirements established within the low target scenario (reduce VMT by five percent per capita, reduce solid waste by five percent per capita, and are 10 percent better than the state's minimum requirements.

Comparable to the PSIC-Bremerton Subarea Plan, this strategy could include implementing a mandatory CTR program expanding vanpool/transit and requiring energy efficient outdoor lighting standards[5]. At the city level these options would require minimal financial contributions, as the majority of the fiscal responsibility would rely on the employers, developers, and taxpayers. There are some challenges implementing a more robust vanpool service in Bremerton such as high fares compared to drivers, and difficulties findings riders and drivers. However, given the success of vanpool services between Kitsap Transit and NBK-Bremerton, this could be an advantageous option for Bremerton to reduce VMT.

High Target Scenario

A high target scenario for Bremerton would be to reduce GHG by more than 10 percent. This could be achieved by more ambitious baseline targets to reduce VMT by ten percent per capita, reduce solid waste by ten percent per capita, and adopt building efficiency standards that require a LEED gold level of certification or higher.

This strategy could be further supported by adopting land use strategies with more stringent growth restrictions, and which increase densities within Bremerton's city center. Increased residential and employment densities tend to have more concentrated trips and can be supportive of alternative modes of travel such as transit, whereas areas of low density tend to have dispersed trip patterns more conducive to trips made by personal vehicle. Implementing land use policies that support residential and employment densities are not without their implementation difficulties such as residents who fear increasing densities will damage the character of their neighborhoods. In addition, adopting an aggressive sustainability strategy requires a high level of funding. However, if these policies are adopted Bremerton could see a significant change in the way its residents travel and reduce total VMT by more than 10 percent.

[4] Formerly the SKIA Subarea Plan

Evaluation Criteria for Transportation Demand Management (TDM) Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	Users	Employers	Municipality*
TRANSPORTATION: PUBLIC MODE SUPPORT MEASURES							
Public Education and Promotion	Increases the effectiveness of other strategies up to 3%	None	Low-medium	✓		✓	✓
Area-wide Ride matching Services	0.1-3.6% VMT reduction	None	Low			✓	✓
Transit Services	Up to 2.5% VMT reduction	Ongoing competition for public funds	Medium-high	✓	✓	✓	
Vanpool Service	Up to 8.3% commute VMT reduction	High fares compared to transit; finding riders & drivers	Medium		✓	✓	
Transit and Vanpool Fares	Up to 2.5% regional VMT reduction	Competition for public funds; equity concerns	Medium	✓	✓	✓	
Non-Motorized Modes	0-2% regional VMT reduction	Minimal for low cost actions; great for high cost actions	Low-high	✓	✓	✓	
HOV Facilities	Up to 1.5% VMT reduction & .2% trip reduction	High cost; public acceptance	Medium-high	✓			
Park and Ride Lots	0-0.5% VMT reduction	None	Medium-high	✓			
TRANSPORTATION: EMPLOYER BASED TDM MEASURES							
Monetary Incentives	8-18% trip reduction at site	Tax implications for some subsidies	Low-medium			✓	
Alternative Work Schedules	As much as a 1% regional VMT reduction	Employee or management reluctance	Low			✓	

Evaluation Criteria for Transportation Demand Management (TDM) Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	Users	Employers	Municipality*
Commute Support Programs	0.1-2.0% regional VMT reduction	None	Low			✓	
Guaranteed Ride Home	Unknown	Liability concerns of employers	Low		✓	✓	
Parking Management	20-30% reduction in SOV trips	Employee opposition	Low to revenue producing		✓	✓	
Facility Amenities	Minimal alone	Space; local zoning requirements	Low to revenue producing			✓	
Transportation Management Associations	6-7% commute trip reduction*	Funding and political support required	Low-medium			✓	✓
TRANSPORTATION: PRICING STRATEGIES							
Congestion Pricing	Up to 5% regional VMT reduction	Public and political resistance; travel alternatives required; technical and enforcement difficulties	Revenue producing		✓		
Parking Tax	1-5% regional VMT and trip reduction	Legislative action; negative public sentiment; opposition from private sector	Revenue producing		✓	✓	
TELECOMMUNICATIONS STRATEGIES							
Telecommuting	Up to 10% commute VMT reduction	Prevailing corporate culture	Low			✓	
LAND USE STRATEGIES							
Development Impact Mitigation	Varies with mitigation requirements	Landowner and developer resistance	Low to medium		✓	✓	

Evaluation Criteria for Transportation Demand Management (TDM) Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	Users	Employers	Municipality*
Mixed Land Use/Jobs Housing Balance	VMT reductions up to 10%	Public resistance; slow rate of effective change	Low to medium	✓	✓		✓
Transit-Oriented and Pedestrian Friendly Design	Increase in transit, bike, and pedestrian trips	Requires design review; developer resistance	Medium to high	✓		✓	
Residential Density Increases	VMT reductions of up to 10% per household	Public and developer resistance to required densities	Medium to high	✓	✓		
Employment Center Density Increases	SOV work trip reductions of up to 50%	Large increase in density often required to realize significant change	Medium to high	✓		✓	
Parking Management	1 to 5% region-wide VMT reduction	Local council action required; public/retailer resistance; enforcement issues	Low		✓	✓	
On-Site Amenities	Unknown; probably reflects effectiveness of mixed use development	Requires policy changes, public, and private inertia are barriers	Low to medium		✓	✓	✓
POLICY & REGULATORY STRATEGIES							
Trip Reduction Ordinances	.1 - 4% regional VMT reduction	Legislative action required; resistance to expanded regulation	Low-medium	✓		✓	✓
Restrict Vehicle Access to Facilities and Activity Centers	2.8-10% VMT reduction	Political will to face public opposition	Low to high	✓			
Parking Maximizing	1-5% trip reduction	Public, developer resistance	Low			✓	

* Costs required of the City for implementation of the strategies to City owned buildings and facilities
**These are listed as Best Management Practices (BMP*) since there is not adequate literature at this time to generalize the mitigation measure reductions
***These ranges are approximate and should not be used in lieu of the specific quantification method provided in the fact sheet for each measure.

Table 2. Greenhouse Gas Reduction Strategies

Evaluation Criteria for Greenhouse Gas (GHG) Reduction Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	*Users*	Employers	Municipality
ENERGY							
Exceed Washington Building Envelope Energy Efficiency Standards by X%	(X is equal to the percentage improvement selected for the project	Developer resistance to more stringent building codes	Medium-high		✓	✓	✓
Install Energy Efficient Appliances	Up to 20% reduction		Medium-high		✓	✓	✓
Install Programmable Thermostat Timers	BMP*	Minimal	Low		✓	✓	✓
Establish Onsite Renewable Energy Systems	0-100% reduction	High cost	High		✓	✓	✓
Install Higher Efficacy Public Street and Area Lighting	16-40% reduction		Low-Medium	✓		✓	
Limit Outdoor Lighting Requirements	BMP*	Safety concerns	Low				✓
Replace Traffic Lights with LED Traffic Lights	90% reduction		Low	✓			
WASTE							
Institute or Extend Recycling and Composting Services	BMP*	Funding and public support required	Low-Medium	✓	✓		
Recycle Demolished Construction Material	BMP*		Low	✓	✓	✓	

Evaluation Criteria for Greenhouse Gas (GHG) Reduction Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	*Users*	Employers	Municipality
WATER							
Use Reclaimed Water	0-40% reduction	Technical feasibility, cost and public policy acceptance	Medium-High	✓			
Use Gray Water	0-100% reduction	Financial support and public education needed	Medium-High	✓			
Install Low-Flow Water Fixtures.	17-31% reduction	Minimal	Low		✓	✓	✓
Adopt a Water Conservation Strategy.	Varies	Minimal	Low	✓			✓
Design Water-Efficient Landscapes	0-70% reduction	Minimal	Low	✓		✓	✓
GENERAL PLAN STRATEGIES							
Fund Incentives for Energy Efficiency	BMP*	Funding and political support required	Low-Medium	✓			✓
Establish a Local Farmer's Market	BMP*	Minimal	Low				✓
Establish Community Gardens	BMP*	Minimal	Low				✓
Plant Urban Shade Trees	BMP*	Minimal	Low-Medium	✓			✓
Implement Strategies to Reduce Urban Heat-Island Effect	BMP*		Low	✓			✓
MISCELLANEOUS							

Evaluation Criteria for Greenhouse Gas (GHG) Reduction Strategies	Range of Effectiveness	Implementation Difficulties	Cost	Who Pays			
				Taxpayers	*Users*	Employers	Municipality
Establish a Carbon Sequestration Project	Varies	Funding and public support required	Low	✓			✓
Establish Off-Site Mitigation	Varies	Funding and public support required	Low	✓			✓
Use Local and Sustainable Building Materials	BMP*	Developer resistance to more stringent building codes	Low-Medium	✓	✓	✓	✓
Require Environmentally Responsible Purchasing	BMP*	Developer resistance to more stringent building codes	Low	✓	✓	✓	✓
Implement an Innovative Strategy for GHG Mitigation	BMP*	Funding and public support required	Low	✓			✓

* Costs required of the City for implementation of the strategies to City owned buildings and facilities
**These are listed as Best Management Practices (BMP*) since there is not adequate literature at this time to generalize the mitigation measure reductions
***These ranges are approximate and should not be used in lieu of the specific quantification method provided in the fact sheet for each measure.

Definitions

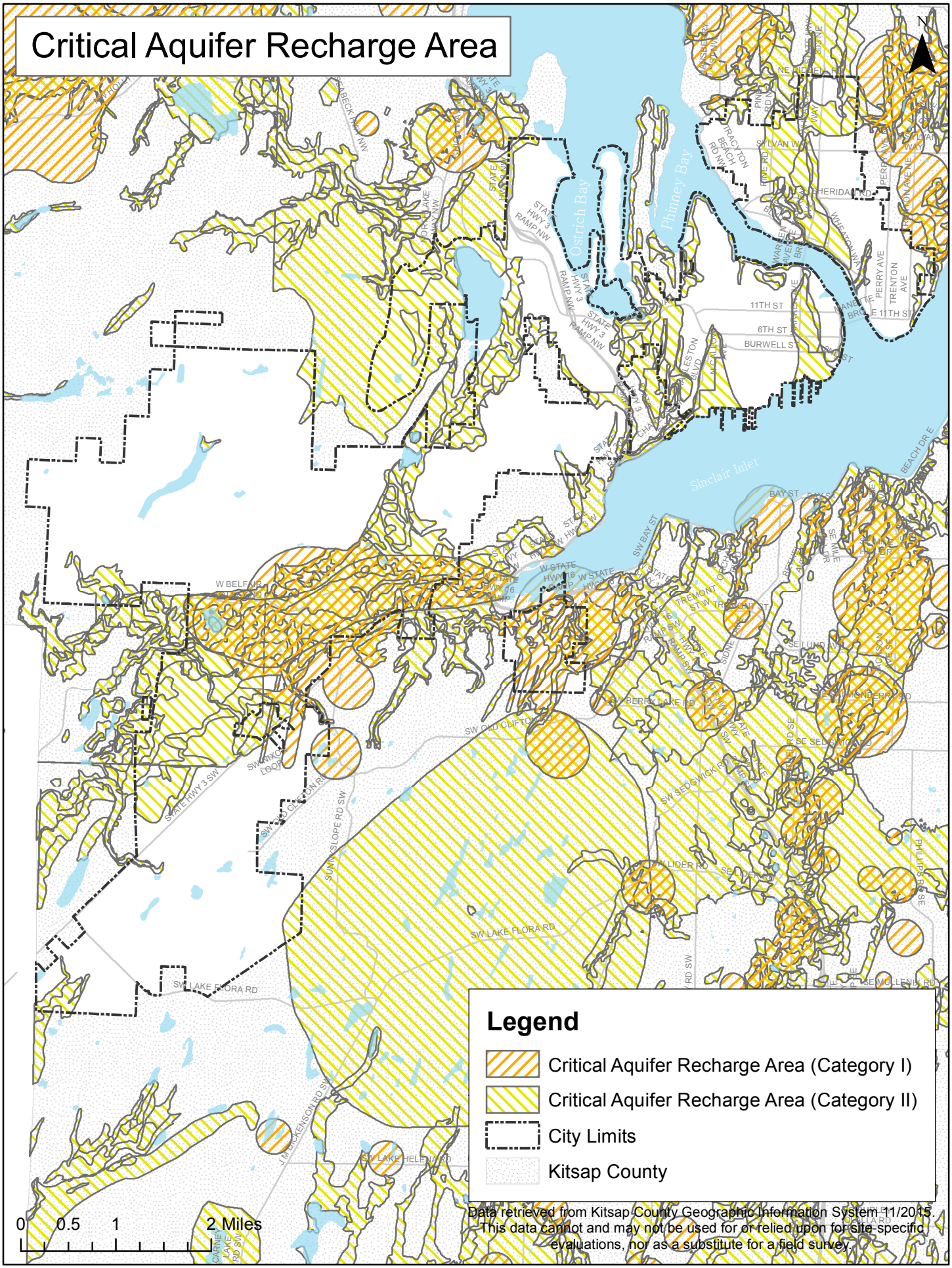
- **Bioretention BMP**: Engineered facilities that store and treat stormwater by passing it through a specified soil profile, and either retain or detain the treated stormwater for flow attenuation. Refer to Chapter 7 of Volume V of the Department of Ecology's SWMMWW (2014) for Bioretention BMP types and design specifications.

- **Low Impact Development (LID):** A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

- **Permeable Pavement:** Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.

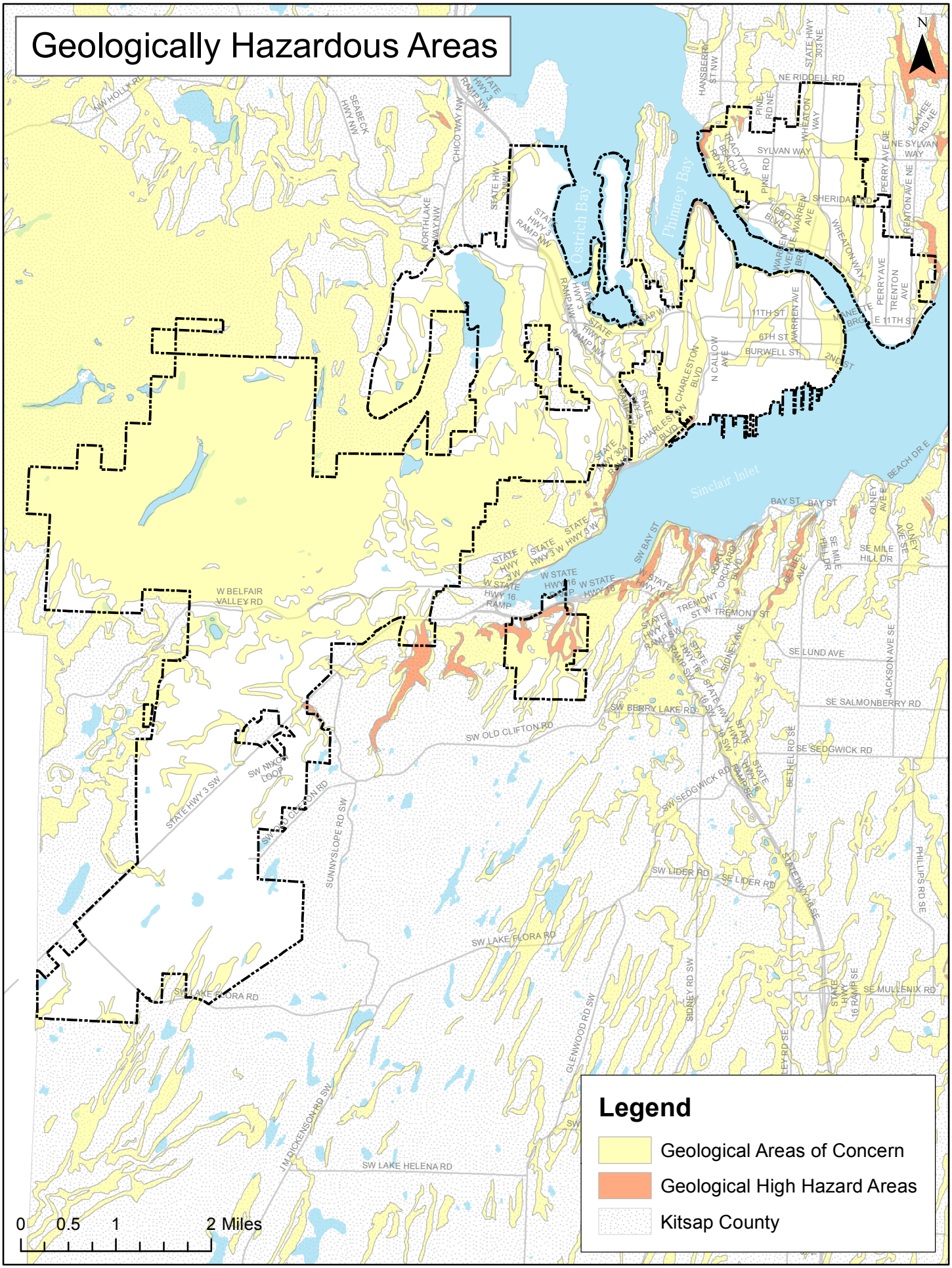
- **Rain garden:** A non-engineered shallow, landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.

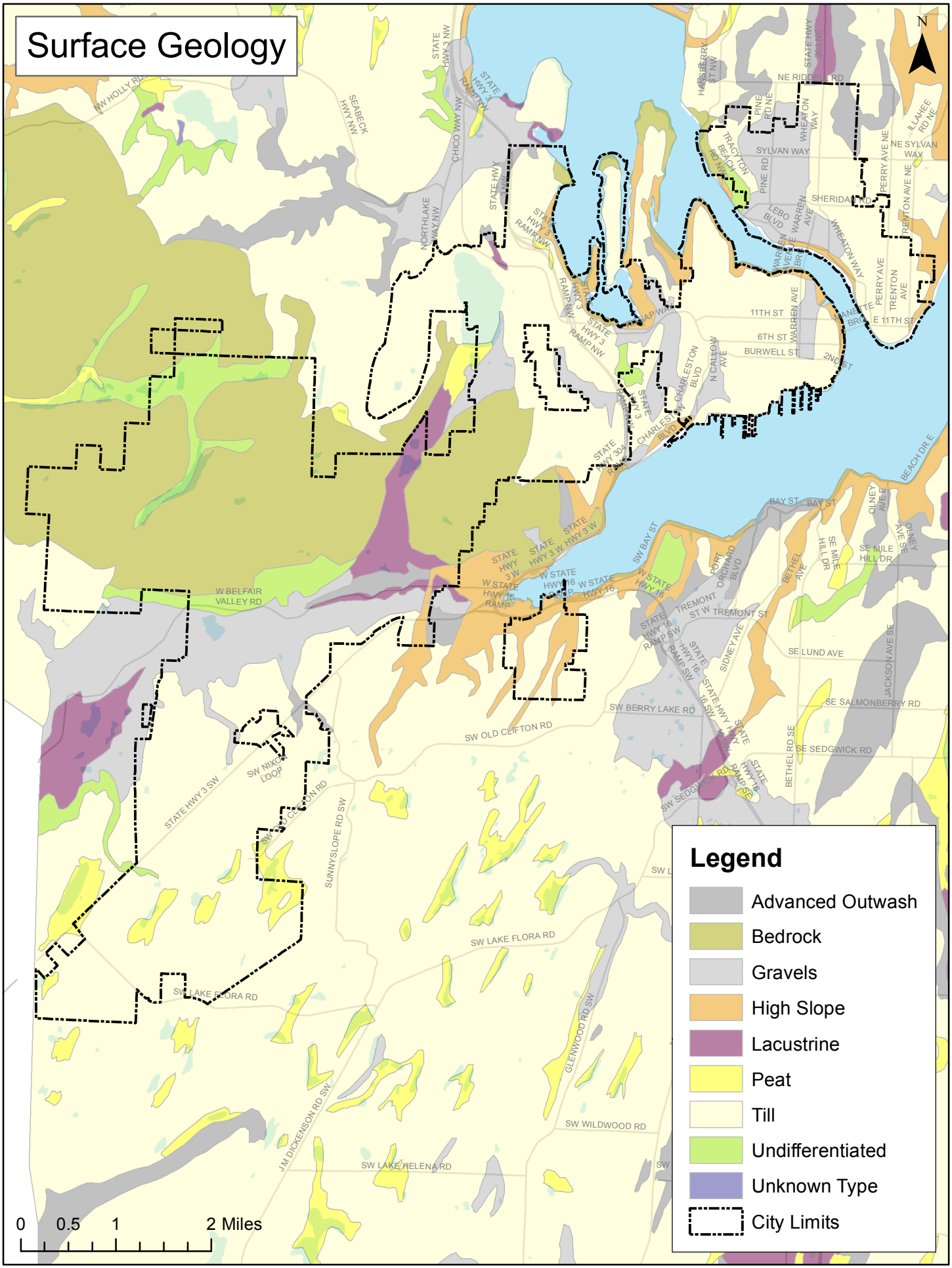
Critical Aquifer Recharge Area



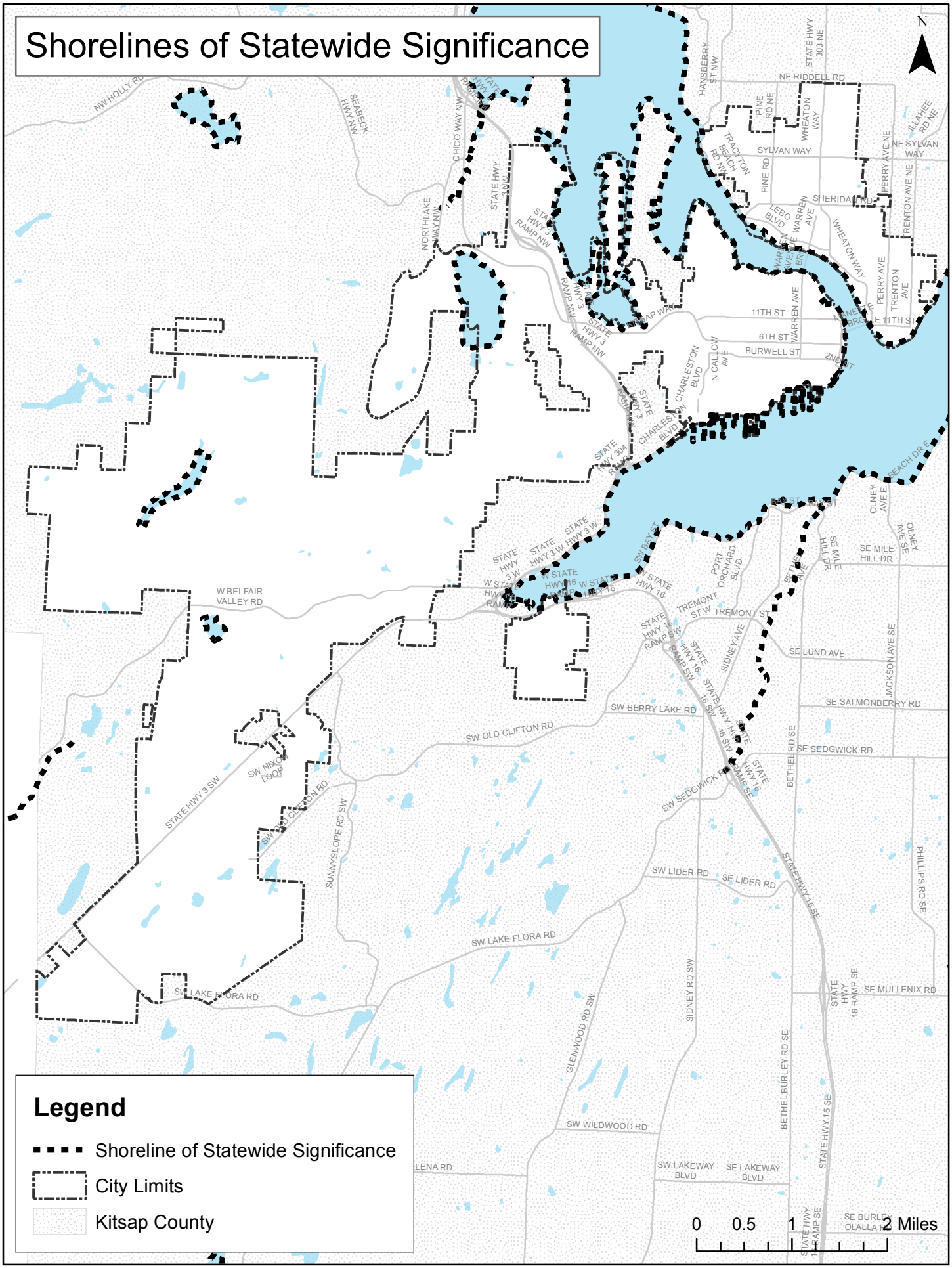
Data retrieved from Kitsap County Geographic Information System 11/2015.
This data cannot and may not be used for or relied upon for site-specific evaluations, nor as a substitute for a field survey.

Geologically Hazardous Areas




Surface Geology
N
Legend
Advanced Outwash
Bedrock
Gravels
High Slope
Lacustrine
Peat
Till
Undifferentiated
Unknown Type
City Limits
0
0.5
1
2 Miles
NW HOLLY RD
SEABECK HWY NW
STATE HWY 3 NW
STATE HWY 3 RAMP NW
CHICO WAY NW
NORTHLAKE WAY NW
STATE HWY 3 NW
STATE HWY 3 RAMP NW
STATE HWY 3 RAMP NW
STATE HWY 3 RAMP NW
STATE HWY 3 RAMP NW
STATE HWY 304 RAMP
HANSBERRY ST NW
STATE HWY 303 NE
NE RIDDELL RD
PINE RD NE
WHEATON WAY
TRACYTON BEACH RD NW
SYLVAN WAY
PINE RD
SHERIDAN RD
LEBO BLVD
WARREN AVE
WHEATON WAY
PERRY AVE NE
NE SYLVAN WAY
ILLAHEE RD NE
TRENTON AVE NE
PERRY AVE
TRENTON AVE
11TH ST
6TH ST
BURWELL ST
2ND ST
WARREN AVE
MANETTE BRG
E 11TH ST
N CALLOW AVE
CHARLESTON BLVD
CHARLESTON BLVD
BEACH DR E
BAY ST
BAY ST
OLNEY AVE E
OLNEY AVE SE
SE MILE HILL DR
SE MILE HILL DR
BETHEL AVE
SW BAY ST
PORT ORCHARD BLVD
W STATE HWY 3 W
STATE HWY 3 W
STATE HWY 3 W
W STATE HWY 16 RAMP
W STATE HWY 16
W STATE HWY 16
W STATE HWY 16
W STATE HWY 16 RAMP
W BELFAIR VALLEY RD
TREMONT ST W
TREMONT ST
STATE HWY 16 RAMP SW
STATE HWY 16 RAMP SW
SIDNEY AVE
SE LUND AVE
JACKSON AVE SE
SE SALMONBERRY RD
SW BERRY LAKE RD
STATE HWY 16 SW
STATE HWY 16 SW
SW OLD CLIFTON RD
SE SEDGWICK RD
BETHEL RD SE
SW SEDGWICK RD
STATE HWY 16 RAMP SE
SW NIXON LOOP
STATE HWY 3 SW
SW OLD CLIFTON RD
SUNNYSLOPE RD SW
SW LAKE FLORA RD
SW LAKE FLORA RD
GLENWOOD RD SW
SW WILDWOOD RD
J M DICKENSON RD SW
SW LAKE HELENA RD

Shorelines of Statewide Significance



Legend

- Shoreline of Statewide Significance
- City Limits
- Kitsap County