DRAFT
SHORELINE CUMULATIVE IMPACTS ANALYSIS

for the City of Kirkland Shoreline Master Program

Prepared by:

City of Kirkland
Planning and Community Development
123 Fifth Avenue
Kirkland, WA 98033

THE WATERSHED COMPANY

750 Sixth Street South
Kirkland, WA 98033

June 2009

The Watershed Company Reference Number:
051011

The Watershed Company Contact Person:
Amy Summe and Dan Nickel

Cite this document as:
The Watershed Company. June 2009. Shoreline Cumulative Impacts Analysis for City of Kirkland Shoreline Master Program. Prepared for the City of Kirkland: Planning and Community Development.

TABLE OF CONTENTS

Page #

1 Introduction 1
2 Existing Conditions 3
2.1 Residential – L Environment 4
2.1.1 Existing Land Use 4
2.1.2 Parks and Open Space/Public Access 5
2.1.3 Shoreline Modifications 5
2.2 Residential – M/H Environment 6
2.2.1 Existing Land Use 6
2.2.2 Parks and Open Space/Public Access 7
2.2.3 Shoreline Modifications 8
2.3 Urban Conservancy 9
2.3.1 Existing Land Use 9
2.3.2 Parks and Open Space/Public Access 9
2.3.3 Shoreline Modifications 10
2.4 Urban Mixed 10
2.4.1 Existing Land Use 11
2.4.2 Parks and Open Space/Public Access 11
2.4.3 Shoreline Modifications 11
2.5 Natural Environment 12
2.5.1 Existing Land Use 12
2.5.2 Parks and Open Space/Public Access 12
2.5.3 Shoreline Modifications 13
2.6 Aquatic Environment 13
2.7 Biological Resources and Critical Areas 13
3 Anticipated Development and Potential Effect on Function 14
3.1 Patterns of Shoreline Activity 14
3.2 Residential Development (Residential – L and Residential M/H) 15
3.3 Higher Intensity Development (Urban Mixed) 18
3.4 Parks and Open Space Development (Natural and Urban Conservancy) 20
3.5 Overwater Structures 20
3.6 Shoreline Stabilization 23
4 Protective SMP Provisions 25
4.1 Environment Designations 25
4.2 General Goals, Policies and Regulations 32
5 Effect of Other Programs 33
5.1 Washington Department of Fish and Wildlife 33
5.2 Washington Department of Ecology 33

5.3 U.S. Army Corps of Engineers 34
6 Restoration Opportunities 34
7 Assessment of Cumulative Impacts 35
8 Net Effect on Ecological Function 43
9 References 44
10 List of Acronyms and Abbreviations 45

LIST OF EXHIBITS

Exhibit 1. Department of Ecology Illustration to Achieve "no net loss" 2
Exhibit 2. Relationship between Parcel Depth and Existing Structure Setback in the Residential – Low Shoreline Environment. 5
Exhibit 3. Relationship between Parcel Depth and Existing Structure Setback in the Residential – Medium/High Shoreline Environment. 8

LIST OF TABLES

Table 1. Length of Shoreline Frontage and Shoreline Area by Environment Designation. 3
Table 2. Existing shoreline residential structure setback data for the Residential – L environment. 4
Table 3. Shoreline armoring in the Residential – L environment. 6
Table 4. In-water structures in the Residential – L environment. 6
Table 5. Existing shoreline residential structure setback data for the Residential – M/H environment. 7
Table 6. Shoreline armoring in the Residential – M/H environment. 8
Table 7. In-water structures in the Residential – M/H environment. 9
Table 8. Shoreline armoring in the Urban Conservancy environment. 10
Table 9. In-water structures in the Urban Conservancy environment. 10
Table 10. Existing shoreline primary structure setback data for the Urban Mixed environment. 11
Table 11. Shoreline armoring in the Urban Mixed environment. 12
Table 12. In-water structures in the Urban Mixed environment. 12
Table 13. Shoreline Permit History in the City of Kirkland Since 1991. 14
Table 14. Anticipated Quantity of New Piers in the City of Kirkland by Environment Designation. 21

Table 16. Shoreline Use and Activities Matrix 26
Table 17. Qualitative Assessment of Cumulative Impacts 37

APPENDICES

Appendix A – Environment Designation Maps
Appendix B – Figures
- Figures 1a-1d: Redevelopable Parcels
- Figure 2: Vacant Parcels
- Figures 3a-3f: Primary Structure Setbacks
- Figure 4: Shoreline Setback Regulation for Lake Ave West R-L Area
- Figures 5a-5e: Shoreline Setback Regulation for R-M/H and UM Environments
- Figures 6a-6d: Shoreline Setback Regulation for R-L Environments (not including Lake Ave West)

Appendix C – Pier Analysis
Appendix D – Vegetation Details

SHORELINE CUMULATIVE IMPACTS ANALYSIS

FOR CITY OF KIRKLAND
SHORELINE MASTER PROGRAM

1 INTRODUCTION

The Shoreline Management Act guidelines (Washington Administrative Code [WAC] 173-26, Part III) require local shoreline master programs (SMPs) to regulate new development to "achieve no net loss of ecological function." The guidelines state that, "To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts" (WAC 173-26-186(8)(d)).

The guidelines further elaborate on the concept of net loss as follows:

> "When based on the inventory and analysis requirements and completed consistent with the specific provisions of these guidelines, the master program should ensure that development will be protective of ecological functions necessary to sustain existing shoreline natural resources and meet the standard. The concept of "net" as used herein, recognizes that any development has potential or actual, short-term or long-term impacts and that through application of appropriate development standards and employment of mitigation measures in accordance with the mitigation sequence, those impacts will be addressed in a manner necessary to assure that the end result will not diminish the shoreline resources and values as they currently exist. Where uses or development that impact ecological functions are necessary to achieve other objectives of RCW 90.58.020, master program provisions shall, to the greatest extent feasible, protect existing ecological functions and avoid new impacts to habitat and ecological functions before implementing other measures designed to achieve no net loss of ecological functions." [WAC 173-206-201(2)(c)]

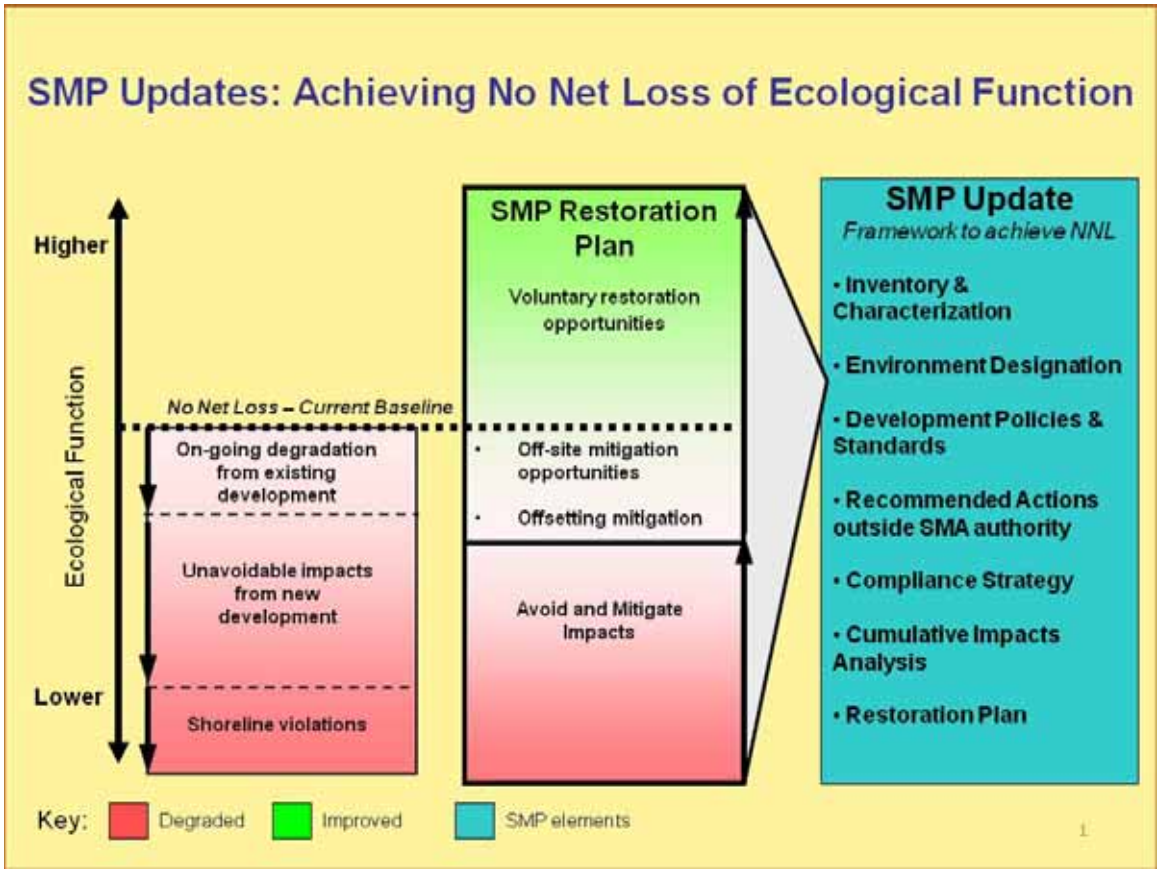
In short, updated SMPs shall contain goals, policies and regulations that prevent degradation of ecological functions relative to the existing conditions as documented in that jurisdiction's characterization and analysis report. For those projects that result in degradation of ecological functions, the required mitigation must return the resultant ecological function back to the baseline. This is illustrated in Exhibit 1 below. The jurisdiction must be able to demonstrate that it has accomplished that goal through an

analysis of cumulative impacts that might occur through implementation of the updated SMP. Evaluation of such cumulative impacts should consider:

(i) current circumstances affecting the shorelines and relevant natural processes;

(ii) reasonably foreseeable future development and use of the shoreline; and

(iii) beneficial effects of any established regulatory programs under other local, state, and federal laws."



Source: Department of Ecology

Exhibit 1. Department of Ecology Illustration to Achieve "No Net Loss"

As outlined in the Shoreline Restoration Plan prepared as part of this SMP update, the SMA also seeks to restore ecological functions in degraded shorelines. This cannot be required by the SMP at a project level, but Section 173-26-201(2)(f) of the Guidelines says: "master programs shall include goals and policies that provide for restoration of such impaired ecological functions." See the Shoreline Restoration Plan for additional discussion of SMP policies and other programs and activities in Kirkland that contribute to the long-term restoration of ecological functions relative to the baseline condition.

The following information and analysis provided in this report provides an overview by proposed environment designation of existing conditions, anticipated development, relevant Shoreline Master Program (SMP) and other regulatory provisions, and the expected net impact on ecological function.

2 EXISTING CONDITIONS

The following summary of existing conditions is based on the Final Shoreline Analysis Report (The Watershed Company 2006) and additional analysis needed to perform this assessment. This discussion has been divided by proposed shoreline environment designations. As shown in Figure 1 in Appendix A, these include Residential – L, Residential M/H, Urban Mixed, Urban Conservancy, Natural, and Aquatic designations. The Shoreline Analysis Report includes an in-depth discussion of the topics below, as well as information about transportation, stormwater and wastewater utilities, impervious surfaces, and historical/archaeological sites, among others.

As shown in Table 1, nearly 40 percent of the City's shoreline frontage and over 60 percent of the City's total shoreline area is designated Natural or Urban Conservancy, the designations assigned to those lands that have higher levels of ecological function and the lower levels of existing and allowed alteration. The majority of the City's shoreline development is concentrated in the remaining 60 percent of the shoreline frontage and 40 percent of the shoreline area, in areas that generally have lower level of ecological function as a result of that development.

Table 1. Length of Shoreline Frontage and Shoreline Area by Environment Designation

Environment Designation	Waterfront Length	Percent of Total Shoreline Frontage	Area in Shoreline Jurisdiction	Percent of Total Shoreline Area
Natural (N)	8,312 Feet (1.57 Miles)	26%	143 acres	58%
Urban Conservancy (UC)	4,514 Feet (0.85 Miles)	14%	18 acres	7%
Residential – Low (R-L)	8,123 Feet (1.54 Miles)	25%	31 acres	13%
Residential – Medium/High (R-M/H)	6,204 Feet (1.18 Miles)	19%	30 acres	12%
Urban Mixed (UM)	5,043 Feet (0.96 Miles)	16%	24 acres	10%
TOTAL	**32,196 Feet (6.1 Miles)**	**100%**	**245**	**100%**

It is important to note that overall Kirkland's shoreline zone is generally deficient in high-quality biological resources and critical areas, with the exception of the wetlands and shoreline areas within and adjacent to Yarrow Bay and Juanita Bay.

2.1 Residential – L Environment

Approximately 13 percent of the City's upland shoreline jurisdiction is in the Residential – L environment. Results from Kirkland's Shoreline Analysis Report (The Watershed Company 2006) show that the majority of the Residential – L environment contains Medium functioning shoreline. Two small areas of Residential – L environment are located along Lake Washington Boulevard, in an area rated as Low functioning. These shoreline analysis results are based on a relative scale of shoreline conditions throughout Kirkland, including the information provided below.

2.1.1 Existing Land Use

The shoreline within the Residential – L environment is exclusively single-family residential. In general, the land area designated as Residential – L is fully developed, containing approximately 35 percent impervious surface. Expansion, redevelopment or alteration to existing single-family units will occur over time (see Figures 1a-d in Appendix B). The Residential – L environment contains 117 lots, 97 of which abut the water. Two lots are vacant, including one waterfront lot (see Figure 2 in Appendix B).

The existing median residential structure setback in the Residential – L environment is approximately 43 feet from the ordinary high water mark (OHWM) (see Figures 3a-f in Appendix B). However, the median distance from the OHWM to improvements (either paved surfaces or other accessory structures) is approximately 36 feet. Table 2 presents data on existing residential structure setbacks on parcels within the Residential – L environment. As Table 2 shows, 23 (24%) of the 97 waterfront parcels have residential structures located less than 30 feet (non-conforming structures) from the OHWM. Of the remaining developed lots, 53 (55%) have residential structures between 30 and 60 feet from OHWM, and 22 (23%) have residential structures greater than 60 feet from the OHWM.

Table 2. Existing shoreline residential structure setback data for the Residential – L environment.

Measure of residential structure setback	Number of Waterfront Parcels
Total Waterfront Parcels	**97**
Structures < 30 ft from OHWM	23
Structures 30 - 60 ft. from OHWM	53
Structures > 60 ft. from OHWM	22

In general, setbacks ranged widely from essentially 0 feet to 232 feet. Setbacks at individual properties seem to be based on several factors, including local topography, lot depth (see Exhibit 2), and location of the sewer line. A cluster of very shallow lots corresponding to very small existing structure setbacks is located south of the Heritage Park street end to just north of Marina Park.

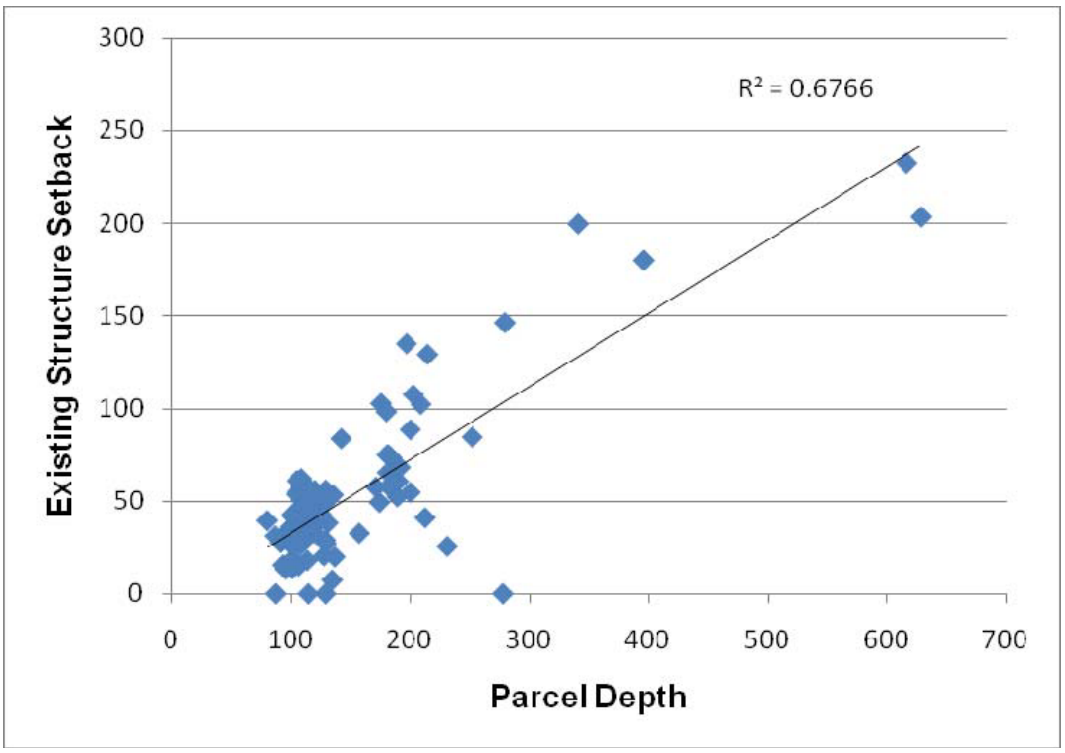


Exhibit 2. Relationship between Parcel Depth and Existing Structure Setback in the Residential – Low Shoreline Environment.

2.1.2 Parks and Open Space/Public Access

There are no formal public parks or open spaces within the Residential – L environment. However, there are several waterfront street ends, though these are presently not developed or used for public purposes.

2.1.3 Shoreline Modifications

The Residential – L environment is heavily modified with just over 88 percent of the shoreline armored at or near the OHWM (Table 3) (see Figures 7a-7e in the Shoreline Analysis Report) and a pier density of approximately 56 piers per mile (Table 4). This compares to 71 percent armored and 36 piers per mile for the entire Lake Washington shoreline (Toft 2001). Thus, for Kirkland's Residential – L environment, pier density and shoreline armoring are much higher than the lake-wide figures.

Table 3. Shoreline armoring in the Residential – L environment.

Shoreline Condition (feet / % of shoreline)	
Armored[1]	Natural / Semi-Natural[2]
7,148 (88%)	975 (12%)

1 "Armored" shorelines encompass angular or rounded granite or basalt boulder, concrete, and wood armoring types.

2 "Natural/Semi-Natural" shorelines captures those areas that are not solidly armored at the ordinary high water line; they may include some scattered boulders or woody debris at or near the ordinary high water line.

Table 4. In-water structures in the Residential – L environment.

Total Number of Piers	Average Number of Piers per Mile	Total Overwater Cover (square feet)
90	56	73,947

It is not uncommon around Lake Washington for some historic fills to be associated with the original bulkhead construction, usually to create a more level or larger yard. Most of these shoreline fills occurred at the time that the lake elevation was lowered during construction of the Hiram Chittenden Locks.

2.2 Residential – M/H Environment

Approximately 12 percent of the City's upland shoreline jurisdiction is in the Residential – M/H environment. Results from Kirkland's Shoreline Analysis Report (The Watershed Company 2006) show that the majority of the Residential – M/H environment contains Low functioning shoreline. However, one small area of Residential – M/H environment is located just west of Juanita Beach Park, in an area rated as High functioning. A second area of Residential – M/H environment is located just north of Marina Park, in an area rated as Medium functioning. These shoreline analysis results are based on a relative scale of shoreline conditions throughout Kirkland, including the information provided below.

2.2.1 Existing Land Use

The shoreline within the Residential – M/H environment is comprised of both single- and multi-family residential uses. In general, the land area is fully developed, containing approximately 54 percent impervious surface. Expansion, redevelopment or alteration to existing multi-family units will occur over time (see Figures 1a-d in

Appendix B). The Residential – M/H environment contains 92 lots, 57 of which abut the water. Five lots are vacant, including four waterfront lots (see Figure 2 in Appendix B).

The existing median residential structure setback in the Residential – M/H environment is approximately 24 feet from the ordinary high water mark (OHWM) (see Figures 3a-f in Appendix B). However, the median distance from the OHWM to improvements (either paved surfaces or other accessory structures) is approximately 15 feet. Table 5 presents data on existing residential structure setbacks on parcels within the Residential – M/H environment. As Table 5 shows, 28 (50%) of the 56 waterfront parcels have residential structures located less than 25 feet from the OHWM. Of these, six residential condominium structures were built out over the water. Of the remaining developed lots, 15 (27%) have residential structures between 25 and 40 feet from OHWM, and 13 (23%) have residential structures greater than 40 feet from OHWM.

Table 5. Existing shoreline residential structure setback data for the Residential – M/H environment.

Measure of primary structure setback	Number of Waterfront Parcels
Total Waterfront Parcels	**56**
Structures < 25 ft from OHWM	28
Structures 25 - 40 ft. from OHWM	15
Structures > 40 ft. from OHWM	13

In general, setbacks ranged widely from essentially 0 feet to 134 feet. This environment also contains several buildings constructed over the water and supported on pilings. Similar to the Residential – L environment, setbacks at individual properties seem to be based on several factors, including lot depth (see Exhibit 3) and location of the sewer line. However, the correlation is not as strong. This is likely because most of the existing multi-family developments attempt to maximize number of units on a given parcel, making it a higher priority to push the development closer to the water.

2.2.2 Parks and Open Space/Public Access

There are no formal public parks or open spaces within the Residential – M/H environment.

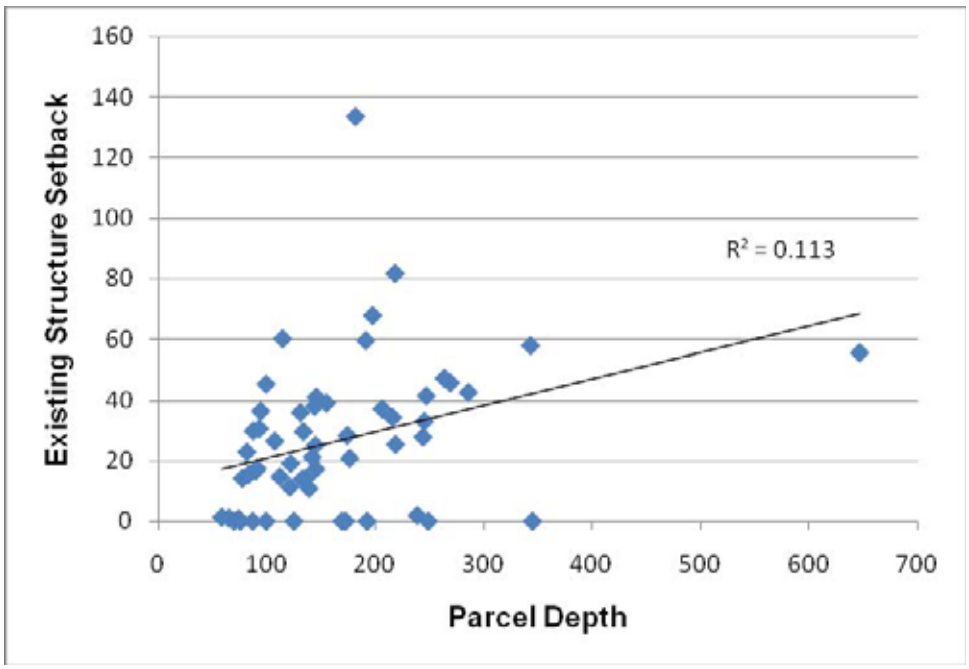


Exhibit 3. Relationship between Parcel Depth and Existing Structure Setback in the Residential – Medium/High Shoreline Environment.

2.2.3 Shoreline Modifications

The Residential – M/H environment is heavily modified with just over 89 percent of the shoreline armored at or near the OHWM (Table 6) (see Figures 7a-7e in the Shoreline Analysis Report) and a pier density of approximately 42 piers per mile (Table 7). This compares to 71 percent armored and 36 piers per mile for the entire Lake Washington shoreline (Toft 2001). Thus, for Kirkland's Residential – M/H environment, pier density and shoreline armoring are both higher than the lake-wide figures, although pier density is lower than the Residential –L environment.

Table 6. Shoreline armoring in the Residential – M/H environment.

Shoreline Condition (feet / % of shoreline)	
Armored[1]	**Natural / Semi-Natural[2]**
5,522 (89%)	682 (11%)

1 "Armored" shorelines encompass angular or rounded granite or basalt boulder, concrete, and wood armoring types.

2 "Natural/Semi-Natural" shorelines captures those areas that are not solidly armored at the ordinary high water line; they may include some scattered boulders or woody debris at or near the ordinary high water line.

Table 7. In-water structures in the Residential – M/H environment.

Total Number of Piers	Average Number of Piers per Mile	Total Overwater Cover (square feet)
49	42	145,571

2.3 Urban Conservancy

Approximately 7 percent of the City's shoreline jurisdiction is in the Urban Conservancy environment. Results from Kirkland's Shoreline Analysis Report (The Watershed Company 2006) show that the Urban Conservancy environment contains areas rated at all three levels of shoreline ecological function (Low, Medium, and High). The area just west of the Juanita Beach Park swimming beach is rated as High. Kiwanis Park, Waverly Park, and the Lave Avenue West Street-end Park are each rated as Medium. Finally, the parks/open spaces located south of Marina Park and north of the Yarrow Bay Wetlands are rated as Low. These shoreline analysis results are based on a relative scale of shoreline conditions throughout Kirkland, including the information provided below.

2.3.1 Existing Land Use

The Urban Conservancy environment is comprised entirely of City-owned parks and street-ends designated as Park/Open Space per the City's Comprehensive Plan. The land area contains approximately 23 percent impervious surface. The existing median primary structure setback in the Urban Conservancy environment is 31 feet, and the mean is 37 feet (see Figures 3a-f in Appendix B). There are 14 parcels in the Urban Conservancy environment, 10 of which abut the water. Nine lots are vacant (likely undeveloped street-ends or parks), including six waterfront lots (see Figure 2 in Appendix B).

2.3.2 Parks and Open Space/Public Access

The City parks listed below provide public access to Lake Washington, as well as provide opportunities for water-dependent, water-related, and water-enjoyment recreational uses.

- Houghton Beach Park
- Marsh Park
- Settler's Landing
- David Brink Park
- Street-end Park
- Lake Avenue West Street-end Park
- Kiwanis Park

- Waverly Beach Park
- Juanita Beach Park

The western portion of Juanita Beach Park, containing Juanita Creek and its associated stream buffer, is designated as Urban Conservancy. However, the heavily used beach area is designated as Urban Mixed (see below).

2.3.3 Shoreline Modifications

The Kirkland shoreline in the Urban Conservancy environment has been modified with approximately 60 percent of the shoreline armored (Table 8) (see Figures 7a -7e in the Shoreline Analysis Report) at or near the OHWM and a total of approximately 7 piers per mile (Table 9). As expected, pier density and shoreline armoring along Kirkland's Urban Conservancy environment is significantly lower than the lake-wide figures.

Table 8. Shoreline armoring in the Urban Conservancy environment.

Shoreline Condition (feet / % of shoreline)	
Armored[1]	Natural / Semi-Natural[2]
2,708 (60%)	1,806 (40%)

1 "Armored" shorelines encompass angular or rounded granite or basalt boulder, concrete, and wood armoring types.

2 "Natural/Semi-Natural" shorelines captures those areas that are not solidly armored at the ordinary high water line; they may include some scattered boulders or woody debris at or near the ordinary high water line.

Table 9. In-water structures in the Urban Conservancy environment.

Total Number of Piers	Average Number of Piers per Mile	Total Overwater Cover (square feet)
18	24	23,206

2.4 Urban Mixed

Approximately 10 percent of the City's upland shoreline jurisdiction is in the Urban Mixed environment. Results from Kirkland's Shoreline Analysis Report (The Watershed Company 2006) show that the majority of the Urban Mixed environment contains Low functioning shoreline. However, the majority of Juanita Beach Park and the adjoining multi-family uses to the east are included in an area rated as High functioning. These shoreline analysis results are based on a relative scale of shoreline conditions throughout Kirkland, including the information provided below.

2.4.1 Existing Land Use

The shoreline within the Urban Mixed environment is comprised of a variety of uses including higher-intensity park/open space (relative to Urban Conservancy or Natural parks), some multi-family residential, and commercial. In general, the land area is fully developed, containing approximately 56 percent impervious surface. The Urban Mixed environment contains 40 lots, 15 of which abut the water. Four lots are vacant, including two waterfront lots (see Figure 2 in Appendix B).

The existing median primary structure setback in the Urban Mixed environment is 28 feet from the ordinary high water mark (OHWM) (see Figures 3a-f in Appendix B). However, the median distance from the OHWM to improvements (either paved surfaces or other accessory structures) is approximately 11 feet. Table 10 presents data on existing residential structure setbacks on parcels within the Urban Mixed environment. As Table 10 shows, 4 (31%) of the 13 waterfront parcels have primary structures located less than 25 feet from the OHWM. Of the remaining developed lots, 5 (38%) have primary structures between 25 and 40 feet from OHWM, and 4 (31%) have primary structures greater than 40 feet from OHWM.

Table 10. Existing shoreline primary structure setback data for the Urban Mixed environment.

Measure of Primary Structure Setback	Number of Waterfront Parcels
Total Developed Waterfront Parcels	**13**
Structures < 25 ft from OHWM	4
Structures 25 - 40 ft. from OHWM	5
Structures > 40 ft from OHWM	4

2.4.2 Parks and Open Space/Public Access

Both Marina Park, located in downtown Kirkland, and the swimming beach at Juanita Beach Park are designated as Urban Mixed.

2.4.3 Shoreline Modifications

The Urban Mixed environment is heavily modified with just over 80 percent of the shoreline armored at or near the OHWM (Table 11) (see Figures 7a-7e in the Shoreline Analysis Report) and a pier density of approximately 14 piers per mile (Table 12). Thus, for Kirkland's Urban Mixed environment, pier density is lower but shoreline armoring is higher than the lake-wide figures.

Table 11. Shoreline armoring in the Urban Mixed environment.

Shoreline Condition (feet / % of shoreline)	
Armored[1]	Natural / Semi-Natural[2]
4,034 (80%)	1,009 (20%)

1 "Armored" shorelines encompass angular or rounded granite or basalt boulder, concrete, and wood armoring types.

2 "Natural/Semi-Natural" shorelines captures those areas that are not solidly armored at the ordinary high water line; they may include some scattered boulders or woody debris at or near the ordinary high water line.

Table 12. In-water structures in the Urban Mixed environment.

Total Number of Piers	Average Number of Piers per Mile	Total Overwater Cover (square feet)
13	14	157,824

2.5 Natural Environment

Approximately 58 percent of the City's upland shoreline jurisdiction is in the Natural environment. These areas all rate as High for existing shoreline ecological function (The Watershed Company 2006).

2.5.1 Existing Land Use

The shoreline within the Natural environment is predominately park/open space, though there are some privately held undeveloped properties located in both the Yarrow Bay and Juanita Bay wetland complexes. The Natural environment contains only 1 percent impervious surface. There are a number of existing, undeveloped lots located within this environment. The Natural environment contains all or portions of 73 lots, 16 of which abut the water. Forty-one lots are vacant, though many of these are in public ownership. Of those privately held, fourteen lots are vacant, including three waterfront lots (see Figure 2 in Appendix B). However, only one of these lots has the potential for development within shoreline jurisdiction due to critical area restrictions (see Figures 1a and 1d in Appendix B). The remaining lots are either owned by the City, or are encumbered by associated wetlands but have upland area outside of shoreline jurisdiction that may accommodate new development.

2.5.2 Parks and Open Space/Public Access

Yarrow Bay Park, Juanita Bay Park and their associated wetlands are designated as Natural.

2.5.3 Shoreline Modifications

The Natural environment contains no shoreline armoring at or near the OHWM (see Figures 7a-7e in the Shoreline Analysis Report) and a very low pier density of approximately 1 pier per mile. Two piers are located within Juanita Bay Park. Thus, as expected, pier density and shoreline armoring within Kirkland's Natural environment are both extremely low compared to the lake-wide figures.

2.6 Aquatic Environment

The Aquatic environment encompasses all areas waterward of the ordinary high water mark of Lake Washington contained within the City limits. The purpose of this designation is to protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high water mark. Regulations and performance standards that apply to individual uses and developments are evaluated under the above designations and uses.

2.7 Biological Resources and Critical Areas

With the exception of the wetlands and shoreline areas within and adjacent to Yarrow Bay and Juanita Bay, Kirkland's shoreline zone itself is generally deficient in high-quality biological resources and critical areas, primarily because of the extensive residential and commercial development and their associated shoreline modifications. Outside of the shoreline associated wetlands, the highest functioning shoreline areas are primarily along city-owned parks and open spaces. Although not specifically separated as a distinct unit during the shoreline inventory, Kiwanis Park represents the highest quality City-owned shoreline, in terms of existing ecological functions, not including the Yarrow Bay and Juanita Bay wetland areas. Many of the parks in both the Urban Conservancy and Urban Mixed environment have the potential for the improvement of ecological functions.

There are a number of streams along the Kirkland shoreline that discharge into Lake Washington. Several, including Juanita Creek, Forbes Creek, Carillon Creek, and Yarrow Creek, are known to support fish use. Adult salmon have been documented in each of these creeks. Many of the smaller tributaries to Lake Washington, including streams that flow seasonally or during periods of heavy rains, are piped at some point and discharge directly to Lake Washington via a closed system.

3 ANTICIPATED DEVELOPMENT AND POTENTIAL EFFECT ON FUNCTION

3.1 Patterns of Shoreline Activity

The City reviewed its shoreline permitting records for the 16 years between 1991 and 2006 (Table 13). Several projects had multiple components and obtained multiple permits; the available permit summary did not consistently indicate which permit type was granted so there are a number of "unknowns." This summary underestimates shoreline activity, as not all shoreline exemptions were tracked.

Table 13. Shoreline Permit History in the City of Kirkland Since 1991.

Year	# of Cases	Pier		Bulkhead Mod.	Upland Structure	Upland Park Mod.	Utilities	Permit Type			
		Extension/ Mod.	New/ Replacement					SDP	SCUP	Variance	Unknown
1991	1				1					1	
1992	5	2	1	1	1	1	1	4	1	1	1
1993	4		3		1			3		1	
1994	3	1	1	1	1			1	1		1
1995	9	1	1		4	1	2	4			5
1996	4		2	1	1		1	2		1	1
1997	4	2			1		1	4			
1998	5	1	1	1	4			3		3	1
1999	6	1	4		1			4		1	1
2000	4	1	1		1		1	2			2
2001	3				3					1	2
2002	2				1		1			1	1
2003	2				2						2
2004	5		2		2		1	3			2
2005	4	1	1	1		1		1			3
2006	3	3			1			1			
TOTAL	**64**	**13**	**17**	**5**	**25**	**3**	**8**	**32**	**2**	**9**	**22**

SDP = Shoreline Substantial Development, SCUP = Shoreline Conditional Use Permit

In addition, a number of shoreline exemptions, not included in the summary table above, have been issued for pier repairs, pier replacements, pier extensions, and bulkhead construction or repair meeting the standards contained in WAC 173-27-040. Also, the numbers below do not include single-family residential development that met the exemption standard contained in WAC 173-27-040.

No trends in shoreline activity or permit type are apparent. Over the past 16 years, 26 percent of permitted shoreline projects included a new or replacement pier component, 20 percent a pier extension or modification component, 8 percent a bulkhead modification component, 39 percent an upland structure component (for new commercial or residential construction, setback variances, etc.), 13 percent a utilities component (sewer lines, sewer lift stations, storm drain outfall dredging, etc.), and 5 percent a parks component (trails, hard landscape elements, benches, etc.). Case notes indicate that pier proposals began to include impact minimization measures, such as deck grating and narrow walkways, prescribed by state and federal agencies in 2000. Although not indicated, it is likely that several of the 1999 pier proposals included minimization measures as well, consistent with the listing of chinook salmon and bull trout as Threatened under the federal Endangered Species Act in 1999.

As indicated by the data presented above, new or replacement piers were very infrequent. Pier extensions or modifications were even less common. Bulkhead modifications were also extremely low, with only 5 applications during the 16 year review period. However, it is expected that the number of these types of proposals, except for new piers, will exceed these rates in coming years as the existing structures and modifications reach their life expectancy.

3.2 Residential Development (Residential – L and Residential M/H)

With the possible exception of limited additional residential lands being acquired for public open space (in the Natural environment of Yarrow Bay wetland complex), residential uses are limited to the Residential –L and Residential – M/H environments. While the single-family nature of Residential – L is not expected to change over the next 20 years, the mix of single- and multi-family developments may change and new development will occur in the Residential – M/H environment. On the whole, a substantial amount of re-builds and remodels are anticipated in both environments.

Typically, development of vacant lots into residential uses would result in replacement of pervious, vegetated areas with impervious surfaces and a landscape management regime that often includes chemical treatments of lawn and landscaping along with increased exterior lighting. These actions can have multiple effects on shoreline ecological functions, including:

1. Increase in surface water runoff due to reduced infiltration area and increased impervious surfaces, which can lead to excessive soil erosion and subsequent in-lake sediment deposition. This can affect the following:

   Hydrologic Functions

   Storing water and sediment

2. Reduction in ability of site to improve quality of waters passing through the untreated vegetation and healthy soils. This can affect the following:

Hydrologic Functions
Removing excess nutrients and toxic compounds

Vegetation Functions
Water quality improvement

3. Potential contamination of surface water from chemical and nutrient applications. This can affect the following:
   Vegetation Functions
   Water quality improvement

4. Elimination of upland habitat occupied by wildlife that use riparian areas. This can affect the following:
   Habitat Functions
   Physical space and conditions for life history
   Food production and delivery

5. Lighting is known to affect both fish and wildlife in nearshore areas. This can affect the following:
   Habitat Functions
   Physical space and conditions for life history

Expansions and remodels of existing residences are likely to occur relatively frequently during the future. Many of these activities would not change the baseline condition of ecological function, although expansions that increase impervious surfaces may occur. Runoff from most expanded residences is clean, however, and water quantity is not an issue in the Lake Washington environment. The significance of impervious surfaces on a lake environment where water quantity is not really a factor is very diminished given the residential uses. Single-family or multi-family homes generally have clean roof and sidewalk runoff, and driveways whether 50 square feet or 5,000 square feet are typically pollution-generating surfaces only to the extent that vehicle-related pollutants are deposited on them. Most single-family homes have between two and four vehicles, regardless of the driveway area and thus the correlation between driveway area and amount of pollution is not strong. However, improperly managed runoff during and post construction could increase erosion, and could cause sediments and pollutants to enter the lake.

In the Residential – L environment, there are four lots that have capacity for further subdivision to create additional building lots, with a total capacity of approximately 17 lots. In addition, in the Residential – L environment, approximately 54 waterfront lots (roughly 56% percent) are considered to have strong redevelopment potential (see Figures 1a-d in Appendix B). Redevelopment potential was based on assumptions made for each lot related to age of the home and the ratio of improvement value to land value. As mentioned above, the existing median setback in the Residential – L environment is 43 feet. The SMP proposes a residential setback of 30 percent of the proposed lot depth, with a 30-foot minimum and a 60-foot maximum (see Figures 6a-d in Appendix B),

except for an area along Lake Avenue West south of the Lake Avenue West street end park. The latter area would have a setback based on the average of the adjacent properties, but no less than 15 feet (see Figure 4 in Appendix B). Based on the City's analysis of redevelopment potential, the resultant median setback in the Residential – L environment would be approximately 36 feet. This reduction in the median setback results in a conversion of a maximum of 1.79 acres of space between the primary structure and the OHWM to a greater level of development. As previously mentioned, two lots in Residential - L are vacant, including one waterfront lot (see Figure 2 in Appendix B). However, the waterfront lot is owned by a private utility company and the upland lot has no development potential.

In the Residential – M/H environment, approximately 20 waterfront lots (roughly 35% percent, including the vacant lots) and approximately 25 overall lots within the shoreline jurisdiction are considered to have strong redevelopment potential (see Figures 1a-d in Appendix B). Redevelopment potential was based on assumptions made for each lot related to the allowed density permitted in the underlying zone and the ratio of improvement value to land value. Expansion (of structure size as well as number of multi-family dwelling units), redevelopment or alteration to existing developments will occur over time, but the majority of this environment will remain functionally unchanged.

As previously mentioned, five lots are vacant, including four waterfront lots (see Figure 2 in Appendix B). Each of these four lots has potential for new multi-family development. However, two of the lots are already altered. One lot has paved parking that appears to be used by the adjacent lot to the north, and a path to the water's edge with a bulkhead and a pier. The second lot has a substantial overwater structure paralleling the nearshore. All of the lots are narrow, between 25 and 50 feet wide; armored; and sandwiched between developments to the north and south and busy Lake Washington Boulevard/Lake Street South to the east. These lots are mostly well vegetated, with one or more trees each, but several also appear to include substantial patches of Himalayan blackberry. The small size of these low-functioning habitat areas and proximity to intensive development and roadways limits their value.

The existing median setback in the Residential – M/H environment is 24 feet. The SMP proposes a residential setback of 15 percent of the proposed lot depth, with a 25-foot minimum (see Figures 5a-e in Appendix B). Based on the City's analysis of redevelopment potential, the resultant median setback in the Residential – M/H environment would be approximately 25 feet, with the average dropping from 27 to 21 feet. This reduction in the average setback results in a conversion of a maximum of 0.74 acre of space between the primary structure and the OHWM to a greater level of development.

These conversion numbers are likely an overestimate, both in area and assumed corresponding function, as primary structures are never as wide as the lot. It also does

not factor in that much of that "lost" space is already occupied by decks, paved surfaces, lawn or other improvements that have reduced or eliminated the function of that space (see Shoreline Vegetation Detail for the Residential – L Environment and Residential M/H in Appendix D). Finally, because of the staggered distribution of lot depths and primary structure locations, some of that space landward of a primary structure currently set back far from the water's edge may be greatly impacted by activities on shallower adjacent lots where the structure is located closer to the water's edge.

However, that space, while perhaps not providing direct habitat to fish and wildlife species, did provide attenuation of exterior and interior lighting with respect to illumination of the water and immediately adjacent shorelands (Rich and Longcore 2006; Rich and Longcore 2004; Mazur and Beauchamp 2006). To offset the reduction in lighting attenuation, the SMP includes provisions in Section 83.470.4 regarding lighting shielding, direction, levels, height, and other standards.

To address the other less direct losses to shoreline function resulting from reduction in the space between primary structures and their attendant activities and the water's edge, the SMP contains a native landscape standard in SMP 83. 400 (Tree Management and Vegetation in Shoreline Setback) that requires native plantings, including trees, in at least 75 percent of the nearshore riparian area located along the water's edge, an average of 10 feet wide in Residential – L and 15 feet wide in Residential – M/H. When a development proposal includes an increase of at least 10 percent in gross floor area of any structure located in shoreline jurisdiction or an alteration to any structure(s) in shoreline jurisdiction, the cost of which exceeds 50 percent of the replacement cost of the structure(s), the development must come into conformity with the landscape standard. Based on the anticipated level of redevelopment in the Residential – L and Residential – M/H environments, approximately 0.85 acre of native vegetation, including trees, will be installed along the water's edge.

Although it is difficult to estimate how many property owners might take advantage of different buffer reduction options, those that do will be required to implement one or more additional ecological function improvements on the site. The amount of reduction allowed for a given improvement is at least proportional to the amount of function lost by allowing the reduction. Further, several of the improvements, such as shoreline armoring removal, would have positive effects on shoreline processes, not just improvements in function.

3.3 Higher Intensity Development (Urban Mixed)

Typically, development of vacant lots would result in replacement of pervious, vegetated areas with impervious surfaces and a landscape management regime that often includes chemical treatments of landscaping along with increased exterior lighting. These actions in the Urban Mixed environment would have identical impacts to those in the Residential – L and M/H environments as discussed above in Section 3.2.

In the Urban Mixed environment, approximately 11 lots in the Urban Mixed environment have additional capacity for development within the shoreline jurisdiction. Most of this potential redevelopment would occur in areas that are separated from the waterfront by major roads or intervening properties. Along the waterfront area, which contained 15 existing lots, only two (roughly 13% percent) are considered to have strong redevelopment potential (see Figures 1a-d in Appendix B). One of the properties has redeveloped since the inventory was completed (Yarrow Bay Marina). The redevelopment resulted in a net increase in shoreline functions, as buildings were relocated back from the shoreline and native plantings were installed along a portion of the shoreline riparian area. Lighting was also shielded in order to limit impacts.

Redevelopment potential was based on assumptions made for each lot related to the allowed intensity of uses, the allowed density permitted in the underlying zone, and the ratio of improvement value to land value. The majority of this environment will functionally remain unchanged, particularly as a large portion of Urban Mixed is occupied by Carillon, which has already been fully developed consistent with its Master Plan. The other major Urban Mixed areas include the core downtown area, including the more intensely utilized Marina Park, and portions of Juanita Beach Park and some adjacent commercial or multi-family developments. Juanita Beach Park was not identified as having "redevelopment potential," but it is actually the subject of a Master Plan that will effectively result in the next 20 years in ecological function improvements. Wetlands and their buffers will be enhanced, and other vegetation improvements will be made.

As mentioned above, the existing median setback in the Urban Mixed environment is 29 feet and the average setback is 38 feet. The SMP proposes a setback of 15 percent of the lot depth, with a 25-foot minimum, except for the Carillon Master Plan area which has a 20-foot setback (see Figures 1a-d in Appendix B). Based on the City's analysis of redevelopment potential, the resultant median setback in the Urban Mixed environment would remain 29 feet, with a slight increase in the average setback to 40 feet. Maintenance of the median setback and a slight increase in the average results in maintenance of the acres of space between the primary structure and the OHWM. As previously mentioned, two waterfront lots in Urban Mixed are vacant; however, these lots are located entirely waterward of the OHWM, and as such have no development potential.

Ecological functions are not expected to change, except to improve, as a result of upland development. However, similar protective provisions that apply to residential development also apply to developments in the Urban Mixed environment. These include restrictions on lighting and a landscape standard, which may result in approximately 0.04 acres of native shoreline vegetation at the redevelopment lots. Further, developments in the Urban Mixed environment may also take advantage of setback reduction incentives that would yield function and process improvements.

3.4 Parks and Open Space Development (Natural and Urban Conservancy)

The Natural environment contains 73 lots (partially and full), 16 of which are waterfront lots. Forty-one of the lots are vacant (open space, parks, critical areas), and 13 of those abut the water's edge. In the Urban Conservancy environment, there are only 14 lots and 10 of those abut the water. Six vacant lots abut the water, and three vacant lots are not contiguous with the water. Although the total number of vacant lots is high in these environments, the actual potential for new and redevelopment in the Natural and Urban Conservancy environments is extremely limited (see Figures 1a-d in Appendix B). First, because most of these properties are public park lands, and second, because many of the remaining properties are completely or substantially encumbered by critical areas (primarily wetlands). The lots in the Urban Conservancy environment are entirely public park property, and no major developments are anticipated. In the Natural environment, the City does not anticipate any new development. On many of the parcels, the portions of the parcel in shoreline jurisdiction are wetland. However, most of these parcels are anticipated to have sufficient upland area (outside of shoreline jurisdiction) to accommodate a single-family house.

Most of the anticipated activities within the City's Natural and Urban Conservancy parks would include routine maintenance and upkeep of existing facilities or restoration elements – replacement of pier decking with grating, removal or enhancement of shoreline armoring, increases in native shoreline vegetation, and restoration of Juanita Creek within shoreline jurisdiction, for example.

In shoreline jurisdiction, ecological functions are not expected to change, except to improve, as a result of shoreland activities.

3.5 Overwater Structures

Piers can adversely affect ecological functions and habitat in the following ways:

1. Alter patterns of natural light transmission to the water column, affecting macrophyte growth and altering habitat for and behavior of aquatic organisms, including juvenile salmon. This can affect the following:
   Habitat Functions
   Physical space and conditions for life history
   Food production and delivery

2. Interfere with long-shore movement of sediments, altering substrate composition and development. This can affect the following:
   Hydrologic Functions
   Attenuating wave energy

or location. Under the proposed SMP, replacement piers are considered new moorage structures and must meet the dimensional criteria for new private piers or be otherwise approved by State and Federal agencies (Washington Department of Fish and Wildlife and the U.S. Army Corps of Engineers) (KZC 83.270.5). Any pier repair which involves the replacement of more than 60 percent of the pier support piles along with pier decking or sub-structure over a five year period must also meet the dimensional criteria of new private piers. Pier repairs (KZC 83.270.7) would include decking and/or sub-structure replacement and up to 50 percent pile replacement. Repairs which involve full deck replacement must install grated surfaces within the nearshore 30 feet.

A summary of the quantitative analysis is provided below (Table 15, full analysis provided in Appendix C), based on City trends and assumptions. Based on the trends and assumptions made regarding new piers, pier replacement, pier repairs, and pier additions, the total area of effective[1] overwater cover would decline by 4.0 percent over a 20-year time period.

Table 15. Summary of Pier Analysis

Existing Overwater Coverage	
Total existing overwater coverage - single-family	93,384
Total existing overwater coverage - multi-family	59,867
Total existing overwater coverage - commercial	133,516
Total existing overwater coverage - public	32,218
Total existing overwater coverage (square footage)	**318,985**
Effective Overwater Coverage at Buildout	
Total overwater cover at buildout - single-family	86,340
Total overwater cover at buildout - multi-family	65,747
Total overwater cover at buildout - commercial	133,199
Total overwater cover at buildout - public	20,820
Total effective overwater coverage at buildout (square footage)	**306,107**
Change in Effective Overwater Coverage at Buildout	
Net change in overwater cover - single-family	-7,044
Net change in overwater cover - multi-family	5,880
Net change in overwater cover - commercial	-317
Net change in overwater cover - public	-11,398
TOTAL CHANGE IN EFFECTIVE OVERWATER COVER AT BUILDOUT	**-12,878**
PERCENTAGE DECREASE IN OVERWATER COVER AT BUILDOUT	**-4.0%**

[1] Note: "Effective" overwater cover is a measure of the actual solid footprint that shades the water, rather than the structure's total footprint. Use of grated decking with a minimum of 40% open space reduces the adverse impacts of the overwater structure, even though the traditional structure footprint may increase.

or location. Under the proposed SMP, replacement piers are considered new moorage structures and must meet the dimensional criteria for new private piers or be otherwise approved by State and Federal agencies (Washington Department of Fish and Wildlife and the U.S. Army Corps of Engineers) (KZC 83.270.5). Any pier repair which involves the replacement of more than 60 percent of the pier support piles along with pier decking or sub-structure over a five year period must also meet the dimensional criteria of new private piers. Pier repairs (KZC 83.270.7) would include decking and/or sub-structure replacement and up to 50 percent pile replacement. Repairs which involve full deck replacement must install grated surfaces within the nearshore 30 feet.

A summary of the quantitative analysis is provided below (Table 15, full analysis provided in Appendix C), based on City trends and assumptions. Based on the trends and assumptions made regarding new piers, pier replacement, pier repairs, and pier additions, the total area of effective[1] overwater cover would decline by 4.2 percent over a 20-year time period.

Table 15. Summary of Pier Analysis

Existing Overwater Coverage	
Total existing overwater coverage - single-family	93,384
Total existing overwater coverage - multi-family	59,867
Total existing overwater coverage - commercial	133,516
Total existing overwater coverage - public	32,218
Total existing overwater coverage (square footage)	**318,985**
Effective Overwater Coverage at Buildout	
Total overwater cover at buildout - single-family	85,908
Total overwater cover at buildout - multi-family	65,747
Total overwater cover at buildout - commercial	133,199
Total overwater cover at buildout - public	20,820
Total effective overwater coverage at buildout (square footage)	**305,675**
Change in Effective Overwater Coverage at Buildout	
Net change in overwater cover - single-family	-7,476
Net change in overwater cover - multi-family	5,880
Net change in overwater cover - commercial	-317
Net change in overwater cover - public	-11,398
TOTAL CHANGE IN EFFECTIVE OVERWATER COVER AT BUILDOUT	**-13,310**
PERCENTAGE DECREASE IN OVERWATER COVER AT BUILDOUT	**-4.2%**

[1] Note: "Effective" overwater cover is a measure of the actual solid footprint that shades the water, rather than the structure's total footprint. Use of grated decking with a minimum of 40% open space reduces the adverse impacts of the overwater structure, even though the traditional structure footprint may increase.

The proposed regulations (**SMP 83.270 and 83.280**) have specifically been crafted to avoid and minimize the following specific potential impacts as outlined below:

1. Growth of aquatic vegetation: Overwater cover is minimized through size and height restrictions for new piers (**SMP 83.270(4)** and **83.280(5)**), restricting size of replacement structures (**SMP 83.270(5)** and **83.280(8)**), and requiring grated decking (**SMP 83.270** and **SMP 83.280**).

2. Juvenile salmon migration: Impacts to juvenile salmon migration are mitigated via the same provisions listed under #1 above. Additionally, new piers must be mitigated through the addition of shoreline vegetation (**SMP 83.270(4)(g) and SMP 83.280(7)**).

3. Sediment movement. Piles and floats are restricted in the nearshore area (**SMP 83.270(4)** and **SMP 83.280(5)**). The use of jetties or groins are prohibited in most environments, except they are allowed only with a Conditional Use Permit in the Urban Mixed and Aquatic environments unless they are part of a restoration project (**SMP 83.170**).

4. Chemical contamination: Piers and other structures shall be constructed of materials that will not adversely affect water quality (**SMP 83.270(5)** and **SMP 83.280(5)**).

5. External lighting impacts: Placement and direction of external lighting is restricted to minimize impacts (**SMP 83.470**).

3.6 Shoreline Stabilization

Bulkheads typically have the following effects on ecological functions:

1. Reduction in nearshore habitat quality for juvenile salmonids and other aquatic organisms. Specifically, shoreline complexity and emergent vegetation that provides forage and cover may be reduced or eliminated. Elimination of shallow-water habitat may also increase vulnerability of juvenile salmonids to aquatic predators. This can affect the following:
   Habitat Functions
   Physical space and conditions for life history
   Food production and delivery

2. Reduction of natural sediment recruitment from the shoreline. This recruitment is necessary to replenish substrate and preserve shallow water conditions. This can affect the following:
   Habitat Functions
   Physical space and conditions for life history

3. Increase in wave energy at the shoreline if shallow water is eliminated, resulting in increased nearshore turbulence that can be disruptive to juvenile fish and other organisms. This can affect the following:

   Hydrologic Functions
   Attenuating wave energy

   Habitat Functions
   Physical space and conditions for life history

Repairs and replacements of existing bulkheads perpetuate those conditions. There have been no new bulkhead permit applications, and only five bulkhead modification permits issued in the last 16 years. Future proposals are likely to be bulkhead repairs and replacements rather than new bulkheads.

The updated SMP states that new shoreline stabilization would only be allowed when "conclusive evidence, documented by a geotechnical analysis, is provided that the structure is in danger from shoreline erosion caused by waves…" It must be demonstrated in a study prepared by a qualified professional that the proposed stabilization is the least harmful method to the environment. Replacement bulkheads must be installed in the same location as the existing bulkhead, or farther landward, and must also demonstrate some level of need for a hardened shoreline stabilization measure. Under no circumstances would a replacement bulkhead be allowed to encroach farther waterward. Finally, all shoreline stabilization and modification proposals must avoid impacts to the maximum extent practicable; use the "softest" stabilization approach feasible; and, when impacts are unavoidable, mitigate those impacts to achieve no net loss of ecological functions. Independent of regulations by other regulatory agencies, the proposed SMP ensures that shoreline stabilization projects will not degrade the baseline condition. Further, the proposed SMP includes incentives for the removal or function enhancement of existing bulkheads in exchange for buffer reduction.

1. The proposed regulations (**SMP 83.400**), as an incentive option in exchange for a shoreline setback reduction (**SMP 83.380**), as well as new pier proposals (**SMP 83.270(4) and SMP 83.280(7)**). Implementation of soft shoreline stabilization techniques (defined in **SMP 83.80**) will also improve shoreline complexity (**SMP 83.300**).

2. Lack of wave attenuation: Wave attenuation should be improved through the implementation of soft shoreline stabilization techniques as identified in #1 above. Some fill waterward of OHWM may occur to enhance nearshore functions (**SMP 83.300**).

Over time, the combined effects of the City's proposed SMP will likely result in a reduction over time of the net amount of hardened shoreline at the ordinary high water mark and an increase in shallow-water habitat.

4 PROTECTIVE SMP PROVISIONS

4.1 Environment Designations

The first line of protection of the City's shorelines is the environment designation assignments. The Natural environment, which comprises nearly 60 percent of the total shoreline area, is the most restrictive, but closely followed by the Urban Conservancy environments. In some respects, the Residential – L, Residential – M/H and Urban Mixed environments are as, or more, restrictive than the other two environments.

Table 16 below identifies the prohibited and allowed uses and modifications in each of the shoreline environments, and clearly shows a hierarchy of higher-impacting uses and modifications being allowed in the already highly altered shoreline environments. This strategy helps to minimize cumulative impacts by concentrating development activity in lower functioning areas that are not likely to experience function degradation with incremental increases in new development.

Table 16. Shoreline Use and Activities Matrix

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
SHORELINE USE						
Resource Land Uses						
Agriculture	X	X	X	X	X	X
Aquaculture	X	X	X	X	X	X
Forest practices	X	X	X	X	X	X
Mining	X	X	X	X	X	X
Commercial Uses						
Water-dependent uses						
Float plane landing and mooring facilities[2]	X	X	X	X	CU	See adjacent upland environments
Water-related, water-enjoyment commercial uses						
Any water-oriented Retail Establishment other than those specifically listed in this chart, selling goods or providing services.	X	SD[3]	X	X	SD	X
Retail Establishment providing new or used Boat Sales or Rental	X	SD[3]	X	CU[4,6]	SD[5]	See adjacent upland environments

[2] Limited to water-based aircraft facilities for air charter operations.
[3] Permitted as an accessory use to a Public Park.
[4] Permitted if located on the west side of Lake Washington Lake Blvd NE/Lake St S south of Lake Avenue West and north of NE 52nd Street.
[5] Permitted in the Juanita Business District or as an accessory use to a marina.

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
Retail establishment providing gas and oil sale for boats	X	X	X	CU[4,6]	CU[6]	See adjacent upland environments
Retail establishment providing boat and motor repair and service	X	X	X	CU[4,6]	CU[6]	X
Restaurant or Tavern[7]	X	X	X	CU[4]	SD	X
Concession Stand	X	SD[3]	X	X	SD[3]	X
Entertainment or cultural facility	X	CU[8]	X	X	SD	X
Hotel or Motel	X	X	X	CU[9]/X	SD	X
Nonwater-oriented, nonwater-dependent uses						
Any Retail Establishment other than those specifically listed in this chart, selling goods, or providing services including banking and related services	X	X	X	X	SD[10]	X
Office Uses	X	X	X	X	SD[10]	X
Neighborhood-oriented Retail Establishment	X	X	X	CU[11]	SD[10]	X
Private Lodge or Club	X	X	X	X	SD[10]	X
Vehicle Service Station	X	X	X	X	X	X

[6] Accessory to a marina only.
[7] Drive-in or drive-through facilities are prohibited.
[8] Use must be open to the general public.
[9] Permitted in Planned Area 3B established in the Lakeview Neighborhood Plan only.
[10] Permitted as part of mixed-use development containing water-oriented uses, where there is intervening development between the shoreline and the use, or if located on the east side of Lake Washington Blvd NE/Lake St S or the east side of 98th Avenue NE.
[11] Permitted if located on the east side of Lake Washington Blvd NE between NE 60th Street and 7th Ave S.

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
Automotive Service Center	X	X	X	X	X	X
Dry land boat storage	X	X	X	X	X	X
Industrial Uses						
Water-dependent uses	X	X	X	X	X	See adjacent upland environments
Water-related uses	X	X	X	X	X	X
Nonwater-oriented uses	X	X	X	X	X	X
Recreational Uses						
Water-dependent uses						
Marina[12]	X	CU	X	SD	SD	See adjacent upland environments
Piers, docks, boat lifts and canopies serving Detached Dwelling Unit[12]	X	X	SD	SD	SD[16]	
Piers, docks, boat lifts and canopies serving Detached, Attached or Stacked Dwelling Units [12]	X	X	X	SD	SD	
Float	X	SD[3]	X	X	SD[3]	
Tour Boat Facility	X	X	X	X	SD[13]	
Moorage buoy[12]	X	SD	SD	SD	SD	
Public Access Pier or Boardwalk	CU	SD	SD	SD	SD	
Boat launch (for motorized boats)	X	X	X	X	CU	
Boat launch (for non-motorized boats)	SD	SD	SD	SD	SD	

[12] No boat moored in or off the shoreline of Kirkland shall be used as a place of habitation.
[13] Permitted as an accessory use to a Marina or Public Park only.

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
Boat houses or other covered moorage not specifically listed	X	X	X	X	X	
Water-related, water-enjoyment uses						
Any water-oriented recreational development other than those specifically listed in this chart	X	CU	CU	CU	SD	X
Other Public Park Improvements[14]	CU	SD	SD	SD	SD	X
Public Access Facility	SD[15]	SD	SD	SD	SD	See adjacent upland environments
Nonwater-oriented uses						
Nonwater-oriented recreational development.	X	X	X	X	SD[10]	X
Residential Uses						
Detached dwelling unit	CU	CU	SD	SD	SD[16]	X
Accessory dwelling unit[17]	X	X	SD	SD	SD[16]	X
Detached, Attached or Stacked Dwelling Units	X	X	X	SD	SD	X
Houseboats	X	X	X	X	X	X
Assisted Living Facility[18]	X	X	X	CU	SD	X

[14] This use does not include other public recreational uses or facilities specifically listed in this chart
[15] Limited to trails, viewpoints, interpretative signage and similar passive and low-impact facilities.
[16] Permitted if located south of NE 60th Street only.
[17] One accessory dwelling unit (ADU) is permitted as subordinate to a single-family dwelling
[18] A nursing home use may be permitted as part of an assisted living facility use.

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
Convalescent Center or Nursing Home	X	X	X	CU[19]	SD[20]	X
Land division	SD[21]	SD[21]	SD	SD	SD	X
Institutional Uses						
Float plane landing and mooring facilities (public)	X	X	X	X	CU	See adjacent upland environments
Government Facility	X	SD	SD	SD	SD	X
Community Facility	X	X	X	X	SD	X
Church	X	X	X	CU[19]	SD[20]	X
School or Day-Care Center	X	X	X	CU[19]	SD[10]	X
Mini-School or Mini-Day-Care Center	X	X	X	SD[19]	SD[10]	X
Transportation						
Water-dependent						
Bridges	CU	CU	SD	SD	SD	See adjacent upland environments
Passenger-only Ferry terminal	X	X	X	X	CU	
Water Taxi	X	SD[22]	SD[22]	SD[22]	SD[22]	

[19] Permitted if located on the east side of Lake Washington Blvd NE/Lake St S, or the east side of 98th Avenue NE.
[20] Not permitted in the Central Business District. Otherwise, permitted if located on the east side of Lake Washington Blvd NE/Lake St S, the east side of 98th Avenue NE or on the south side of NE Juanita Drive.
[21] May not create any new lot that would be wholly contained within shoreland area in this shoreline environment.

[22] Permitted as an accessory use to a marina or a public park.

The chart is coded according to the following legend. SD = Substantial Development CU = Conditional Use X = Prohibited; the use is not eligible for a Variance or Conditional Use Permit	**Natural**	**Urban Conservancy**	**Residential - L**	**Residential – M/H**	**Urban Mixed**	**Aquatic**
Nonwater-oriented						
Arterials, Collectors, and neighborhood access streets	CU	SD[23]/CU	SD	SD	SD	X
Helipad	X	X	X	X	X	X
Utilities						
Utility production and processing facilities	X	CU[24]	CU[24]	CU[24]	CU[24]	X
Utility transmission facilities	CU[24]	SD[24]	SD[24]	SD[24]	SD[24]	CU[24]
Personal Wireless Service Facilities[25]	X	SD	SD	SD	SD	X
Radio Towers	X	X	X	X	X	X
SHORELINE MODIFICATIONS						
Breakwaters/jetties/rock weirs/groins	X	X	X	SD[26]/CU	SD[26]/CU	See adjacent upland environments
Dredging and dredge materials disposal	SD[26]/CU	SD[26]/CU	SD[26]/CU	SD[26]/CU	SD[26]/CU	
Fill waterward of the ordinary high water mark	SD[26]/CU	SD[26]/CU	SD[26]/CU	SD[26]/CU	SD[26]/CU	
Land surface modification	SD[26]/CU	SD	SD	SD	SD	
Shoreline habitat and natural systems enhancement projects	SD	SD	SD	SD	SD	
Hard Structural Shoreline Stabilization	X	CU	SD	SD	SD	
Soft Shoreline Stabilization Measures	X	SD	SD	SD	SD	

[23] Construction of pedestrian and bicycle facilities only.
[24] This use may be allowed provided there is no other feasible route or location.
[25] New towers are not permitted.
[26] Permitted under a substantial development permit when associated with a restoration or enhancement project.

4.2 General Goals, Policies and Regulations

The SMP contains numerous general policies, with supporting regulations (see SMP), intended to protect the ecological functions of the shoreline, prevent adverse cumulative impacts, and encourage restoration. Some key policies substantially contributing to prevention of adverse cumulative impacts are summarized below.

- **Policy SMP-1.2**: Preserve and enhance the natural and aesthetic quality of important shoreline areas while allowing for reasonable development to meet the needs of the city and its residents.
- **Policy SMP-3.1**: Establish development regulations that avoid, minimize and mitigate impacts to the ecological functions associated with the shoreline zone.
- **Policy SMP-3.2**: Provide adequate setbacks and buffers from the water and ample open space and pervious areas to protect natural features and minimize use conflicts.
- **Policy SMP-3.3**: Require new development or redevelopment to include establishment or preservation of appropriate shoreline vegetation to contribute to the ecological functions of the shoreline area.
- **Policy SMP-3.4**: Incorporate low-impact development practices, where feasible, to reduce the amount of impervious surface area.
- **Policy SMP-3.6**: Limit outdoor lighting levels in the shoreline to the minimum necessary for safe and effective use
- **Policy SMP-3.8**: Encourage the development of joint-use overwater structures, such as joint use piers, to reduce impacts to the shoreline environment
- **Policy SMP-3.9**: Allow variations to development standards that are compatible with surrounding development in order to facilitate restoration opportunities along the shoreline
- **Policy SMP-6.4:** Evaluate new single-family development within areas impacted by critical areas to protect ecological functions and ensure some reasonable economic use for all property within Kirkland's shoreline
- **Policy SMP-10.1:** Assure that shoreline modifications individually and cumulatively do not result in a net loss of ecological functions
- **Policy SMP-10.2:** Limit fill waterward of the ordinary high water mark to support ecological restoration or to facilitate water-dependent or public access uses
- **Policy SMP-10.6:** Limit use of hard structural stabilization measures to reduce shoreline damage
- **Policy SMP-10.7:** Design, locate, size and construct new or replacement structural shoreline protection structures to minimize and mitigate the impact of these activities on the Lake Washington shoreline.
- **Policy SMP-10.9:** Encourage salmon friendly shoreline design during new construction and redevelopment by offering incentives and regulatory flexibility to improve the design of shoreline protective structures and revegetate shorelines.

- **Policy SMP-11.2:** Design and construct new or expanded piers and their accessory components, such as boatlifts and canopies, to minimize impacts on native fish and wildlife and their habitat.
- **Policy SMP-12.1:** Include provisions for shoreline vegetation restoration, fish and wildlife habitat enhancement, and low impact development techniques in projects located within the shoreline, where feasible.
- **Policy SMP-13.1:** Conserve and protect critical areas within the shoreline area from loss or degradation.
- **Policy SMP-15.2:** Prevent impacts to water quality.
- **Policy SMP-16.1:** Plan and design new development or substantial reconstruction to retain or provide shoreline vegetation.
- **Policy SMP-19.1:** Manage natural areas within the shoreline parks to protect and restore ecological functions, values and features.
- **Policy SMP-19.2:** Promote habitat and natural resource conservation through acquisition, preservation, and rehabilitation of important natural areas, and continuing development of interpretive education programs.

5 EFFECT OF OTHER PROGRAMS

5.1 Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife (WDFW) has jurisdiction over in- and over-water activities up to and including the ordinary high water mark, as well as any other activities that could "use, divert, obstruct, or change the bed or flow of state waters" (http://www.wdfw. wa.gov/hab/hpapage.htm). Practically speaking, these activities in the City of Kirkland include, but are not limited to, installation or modification of shoreline stabilization measures, piers and accessory structures such as boatlifts, culverts, and bridges and footbridges. These types of projects must obtain a Hydraulic Project Approval from WDFW, which will contain conditions intended to prevent damage to fish and other aquatic life, and their habitats. In some cases, the project may be denied if significant impacts would occur that could not be adequately mitigated.

5.2 Washington Department of Ecology

The Washington Department of Ecology may review and condition a variety of project types in Kirkland, including any project that needs a permit from the U.S. Army Corps of Engineers (see below), any project that requires a shoreline Conditional Use Permit or Shoreline Variance, and any project that disturbs more than 1 acre of land. Project types that may trigger Ecology involvement include pier and shoreline modification proposals and wetland or stream modification proposals, among others. Ecology's three primary goals are to: 1) prevent pollution, 2) clean up pollution, and 3) support sustainable

communities and natural resources (http://www.ecy.wa.gov/about.html). Their authority comes from the State Shoreline Management Act, Section 401 of the Federal Clean Water Act, the Federal Water Pollution Control Act, the Federal Coastal Zone Management Act of 1972, the State Environmental Policy Act, the Growth Management Act, and various RCWs and WACs of the State of Washington.

5.3 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers has jurisdiction over any work in or over navigable waters (including Lake Washington) under Section 10 of the Federal Rivers and Harbors Act of 1899, and discharges of dredged or fill material into waters of the United States (including Lake Washington, streams, and non-isolated wetlands) under Section 404 of the Federal Clean Water Act.

As a federal agency, any activity within Corps jurisdiction that could affect species listed under the Federal Endangered Species Act must be consulted on with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. These agencies ensure that the project includes impact minimization and compensation measures for protection of listed species and their habitats. Since salmon were first listed in Puget Sound, the Corps and the other federal agencies have been working closely to streamline the permitting process, particularly for new pier and pier modification projects. The result of those efforts for Lake Washington has culminated in Regional General Permit (RGP) 3 and a Programmatic Biological Evaluation for Bank Stabilization in Lake Washington. As mentioned above, RGP 3 has been the partial basis for the pier dimensional standards included in the proposed Kirkland SMP.

6 Restoration Opportunities

As discussed above, one of the key objectives that the SMP must address is "no net loss of ecological shoreline functions necessary to sustain shoreline natural resources" (Ecology 2004). However, SMP updates seek not only to maintain conditions, but to improve them:

> "…[shoreline master programs] include planning elements that when implemented, serve to improve the overall condition of habitat and resources within the shoreline area of each city and county (WAC 173-26-201(c))."

The guidelines state that "master programs shall include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program" (WAC 173-26-201(2)(f)). Pursuant to that direction, the City has prepared a Shoreline Restoration Plan.

Practically, it is not always feasible for shoreline developments and redevelopments to achieve no net loss at the site scale, particularly for those developments on currently undeveloped properties or a new pier or bulkhead. The Restoration Plan, therefore, can be an important component in making up that difference in ecological function that would otherwise result just from implementation of the SMP. The Restoration Plan represents a long-term vision for restoration that will be implemented over time, resulting in incremental improvement over the existing conditions.

The Shoreline Restoration Plan identifies a number of project-specific opportunities for restoration on both public and private properties inside and outside of shoreline jurisdiction (see Figure 15 in the Final Shoreline Analysis Report), and also identifies ongoing City programs and activities, non-governmental organization programs and activities, and other recommended actions consistent with the *Final Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan*.

7 Assessment of Cumulative Impacts

The following table (Table 17) summarizes for each environment designation the existing conditions (Chapter 2 above), anticipated development (Chapter 3 above), relevant Shoreline Master Program (SMP) and other regulatory provisions, and the expected net impact on ecological function. The complete assessment of overwater structure impacts is presented in Section 3.5, organized by pier type rather than environment designation. The discussion of existing conditions is based on the *Final Shoreline Analysis Report* (The Watershed Company 2006), and additional analysis conducted to perform this assessment. The Analysis Report includes a more in-depth discussion of the topics below, as well as information about transportation, stormwater and wastewater utilities, impervious surfaces, and historical/archaeological sites, *among others.*

A distinct discussion of the Aquatic environment designation is not included, as any developments waterward of the OHWM are associated with and discussed under either Section 3.5 above or in the corresponding upland environment designation section.

Table 17. Qualitative Assessment of Cumulative Impacts

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
Residential – L			
This segment is dominated by single-family homes and is almost entirely built out. Nearly the entire shoreline has been altered with a variety of armoring and alteration types, including piers, boatlifts, boathouses, and moorage covers. Approximately 93 percent of all residences already have a pier and the shoreline is approximately 88 percent armored.	**FUTURE DEVELOPMENT** in the Residential – L environment will likely be restricted to remodeled or expanded residences since only two vacant lots (2 percent) exist in shoreline jurisdiction, and both have no development potential. Based on a ratio of land value to structure value and age of existing structure (35+ years old), the City anticipates that approximately 54 (56 percent) of existing developed lots will likely redevelop. No change in uses is anticipated. **FUNCTIONS/PROCESSES IMPACTED**: As described in Section 3.2, new and re-development may be accompanied by: 1. *Impervious surface increases* 2. *Vegetation removal* 3. *Chemical contaminant increases* 4. *External lighting impacts* Additional impacts could occur with associated new pier development and shoreline modification; these are cumulatively discussed in Sections 3.5 and 3.6. These impacts may affect: 5. *Growth of aquatic vegetation* 6. *Juvenile salmon migration and behavior* 7. *Sediment movement* 8. *Chemical contamination* 9. *External lighting impacts on overwater structures* 10. *Shoreline complexity* 11. *Wave attenuation*	Several facets of the SMP development standards for the Residential – L environment are aimed at minimizing potential impacts to shoreline ecological functions that are discussed in Sections 3.2, 3.5, and 3.6. Residential setbacks are one of the key components to assess overall impacts to ecological function as they relate to many of the items listed below. Structure setbacks are regulated under **SMP 83.180** and **SMP 83.380**. Under these scenarios and an anticipated redevelopment of up to 54 lots, the median residential setback would change from 43 feet to 36 feet. 1. *Impervious surface increases* No change in impervious surface requirements is proposed under the new SMP. However, with the anticipated level of redevelopment, expansion of impervious surfaces is anticipated. Based on the 54 lot redevelopment potential mentioned above, approximately 1.79 acres of land area between existing primary structures and the water's edge would become impervious while 0.55 acres of nearshore area would be revegetated with native plants. The proposed SMP requires that all new and redeveloped lots include provisions to control stormwater runoff which will minimize erosion and sediment and pollutant delivery (**SMP 83.480**). Additional restrictions may be chosen by applicants reducing their setbacks, such as inclusion of biofiltration/ infiltration mechanisms and use of pervious material (**SMP 83.380**). 2. *Vegetation Removal* Retention of existing vegetation is regulated by **SMP 83.400** which requires applicants to plant at least 75 percent of the nearshore area with native vegetation. Removal of significant trees within the shoreline setback shall be mitigated at a 3:1 ratio.	**Other Regulatory Programs:** Any in- or over-water proposals, primarily piers and shoreline reconstruction, would require review not only by the City of Kirkland, but also by the WDFW, the U.S. Army Corps of Engineers (Corps), and/or Ecology. Each of these agencies is charged with regulating and/or protecting streams, lakes, and wetlands, and would impose certain design or mitigation requirements on applicants. Due to Endangered Species Act consultation requirements with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, the Corps has developed recommendations to minimize project impacts. These include Regional General Permit 3 (RGP-3) for overwater structures and a Programmatic Biological Evaluation for shoreline stabilization. WDFW also follows similar design standards as the Corps and the City of Kirkland has included many of these standards within the proposed SMP. These agencies would also impose certain design and mitigation requirements on a proposed project to minimize adverse impacts. Outside of the immediate shoreline zone, short- and long-term stormwater management per the latest Ecology Stormwater Manual would minimize/eliminate construction-related stormwater runoff impacts and may slowly improve the quality of any waters reaching the shoreline. **Non-Regulatory Restoration Actions** Although no specific restoration projects have been identified in the Residential – L environment, the City's Shoreline Restoration Plan does include goals and objectives with an emphasis on public education and involvement intended to promote voluntary shoreline enhancement and restoration on private land. Examples of specific items include: • Encourage salmon friendly shoreline design during new construction or redevelopment • Offer incentives for voluntary removal of bulkheads, beach improvement, riparian revegetation • Encourage low impact development through regulations, incentives, education/training, and demonstration projects • Through grant funding sources, restoration opportunities may be available to multiple contiguous shoreline properties, including residential lots that are interested in improving shoreline function.

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
		3. *Chemical contaminant increases* No new development is anticipated, and potential redevelopment is unlikely to result in an increased level of chemical contaminants (pesticides/herbicides etc). Reductions in existing chemical usage may occur with redevelopment if applicants chose to utilize shoreline setback reduction alternatives (**SMP 83.380**) which implement landscape best management practices and may limit lawn area. Further, under **SMP 83.480**, developments will need to follow the City's adopted surface water design manual with respect to treatment and stormwater conveyance. 4. *External lighting impacts* Lighting shall be controlled to minimize adverse effects on fish and wildlife and their habitats (**SMP 83.470**) (Note: items 5-11 addressed in Sections 3.5 and 3.6)	
Residential – M/H			
This segment is almost entirely built out and dominated by multi-family housing with some single-family uses spread throughout. Nearly the entire shoreline has been altered with a variety of armoring and alteration types, including piers, boatlifts, boathouses, and moorage covers. 81 percent of all lots already have a pier and the shoreline is approximately 89 percent armored.	**FUTURE DEVELOPMENT** in the Residential – M/H environment will likely be restricted to remodeled or expanded single- and multi-family residences since only 4 vacant lots (7 percent) exist in shoreline jurisdiction. Based on residential development capacity and a ratio of land value to structure value, the City anticipates that approximately 20 (36 percent) of existing waterfront developed lots will likely redevelop. Although some change in use may occur from property to property, no net change in functional uses are anticipated throughout the Residential – M/H environment. **FUNCTIONS/PROCESSES IMPACTED:** The functions and processes affected by	Several facets of the SMP development standards for the Residential – M/H environment are aimed at minimizing potential impacts to shoreline ecological functions that are discussed in sections 3.2, 3.5, and 3.6. Structure setbacks are one of the key components to assess overall impacts to ecological function as they relate to many of the items listed below. Structure setbacks are regulated under **SMP 83.180** and **SMP 83.380.** Under these scenarios and an anticipated redevelopment of up to 20 lots, the median setback would increase from 24 feet to 25 feet. See discussion above under Residential – L environment for expanded details as to how the SMP Provisions address the following impacts. 1. *Impervious surface increases* No change in impervious surface requirements are proposed under the new	**Other Regulatory Programs:** As described above under the Residential – L environment, any in- or over-water proposals, primarily piers and shoreline reconstruction, would require review not only by the City of Kirkland, but also by the WDFW, the U.S. Army Corps of Engineers (Corps), and/or Ecology. The Corps would use RGP-3 to review small residential pier projects or joint-use proposals involving no more than three residences. Projects which involve larger overwater structures would likely require a Biological Assessment for consultation with the federal Services. The programmatic Biological Evaluation for shoreline stabilization would likely apply to both single- and multi-family property within the City. As mentioned above, these agencies would also impose certain design and mitigation requirements on a proposed project to minimize adverse impacts. Stormwater management, as described above under Residential – L environment, would likely minimize/eliminate construction-related stormwater runoff impacts and may slowly improve the quality of any waters reaching the shoreline. **Non-Regulatory Restoration Actions** Although no specific restoration projects have been identified in the Residential – M/H environment, the City's Shoreline Restoration Plan does include goals and objectives with an emphasis on public education and involvement intended to promote voluntary shoreline enhancement and restoration on private land. See the Residential – L discussion above for examples.

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
	future development within the Residential – M/H environment are very similar to those described above for the Residential – L environment. However, given the existing built out condition (impervious surfaces already total over 54 percent of the total shoreline jurisdiction for Residential –M/H) impacts on ecological functions from future expansion are anticipated to be less. Regardless, development impacts may include: 1. *Impervious surface increases* 2. *Vegetation removal* 3. *Chemical contaminant increases* 4. *External lighting impacts* 5. *Growth of aquatic vegetation* 6. *Juvenile salmon migration and behavior* 7. *Sediment movement* 8. *Chemical contamination* 9. *External lighting impacts on overwater structures* 10. *Shoreline complexity* 11. *Wave attenuation*	SMP. Based on the redevelopment potential mentioned above, approximately 0.74 acres of land area between existing primary structures and the water's edge would become impervious while 0.3 acre of nearshore area would be revegetated with native plants. Stormwater provisions are included in **SMP 83.480**. Additional impact reductions are listed in **SMP 83.380**. 2. *Vegetation Removal* Retention of existing vegetation is regulated by **SMP 83.400**. For the Residential – M/H environment, this also requires an average of 15 feet of riparian vegetation planted from the OHWM (**SMP 83.4001)(d)(1)**). Removal of significant trees in the setback shall be mitigated at a 3:1 ratio. 3. *Chemical contaminant increases* Shoreline setback reduction alternatives (**SMP 83.380**) include landscape best management practices and may limit lawn area. 4. *External lighting impacts* Lighting shall be controlled to minimize adverse effects on fish and wildlife and their habitats (**SMP 83.470**). However, several exemptions from the lighting standards are included, such as emergency lighting, public rights-of-way (i.e. trails), and seasonal lighting (**SMP 83.470(2)(a)**). (Note: items 5-11 addressed in Sections 3.5 and 3.6)	
Urban Conservancy			
This segment contains land areas in shoreline jurisdiction generally dominated by City parks and open spaces. These areas include, the western portion of Juanita Beach Park, Kiwanis Park, Waverly Park, Lake Ave West Street-end Park, Street-end Park, David Brink Park, Settler's Landing, Marsh Park, and Houghton Beach Park.	**FUTURE DEVELOPMENT** in the Urban Conservancy environment will be very limited. As discussed above in Section 3.4, the "vacant' lots are all public property managed for parks and open space. There will be a number of park improvements, including implementation of the Juanita Beach Park Master Plan (which includes stream and wetland restoration), repairs	Several facets of the SMP development standards for the Urban Conservancy environment are aimed at minimizing potential impacts to shoreline ecological functions that are discussed in sections 3.4, 3.5, and 3.6. Structure setbacks are one of the key components to assess overall impacts to ecological function as they relate the items listed below. Structure setbacks are regulated under **SMP 83.180** and **SMP 83.380**. In the Urban Conservancy	**Other Regulatory Programs:** Any in- or over-water proposals, primarily piers and shoreline reconstruction, would require review not only by the City of Kirkland, but also by the WDFW, the U.S. Army Corps of Engineers (Corps), and/or Ecology. Each of these agencies is charged with regulating and/or protecting streams, lakes, and wetlands, and would impose certain design or mitigation requirements on applicants. Due to Endangered Species Act consultation requirements with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, the Corps has developed recommendations to minimize project impacts. These include Regional General Permit 3 (RGP-3) for overwater structures and a Programmatic Biological Evaluation for shoreline stabilization. WDFW also follows similar design standards as the Corps and the City of Kirkland has included many of these standards within the proposed SMP. These agencies would also impose certain design and mitigation requirements on a proposed project to minimize adverse impacts.

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
	to overwater structures (including conversions to grated decking), and enhancements to armored shorelines. No change in uses is anticipated. **FUNCTIONS/PROCESSES IMPACTED:** The anticipated alterations to parks are expected to alter, in most cases beneficially, the following upland functions. 1. *Impervious surface* 2. *Vegetation/habitat* Additional impacts could occur with associated overwater structure development and shoreline modification; these are cumulatively discussed in Sections 3.5 and 3.6. These impacts may affect: 3. *Growth of aquatic vegetation* 4. *Juvenile salmon migration and behavior* 5. *Sediment movement* 6. *Chemical contamination* 7. *External lighting impacts on overwater structures* 8. *Shoreline complexity* 9. *Wave attenuation*	environment, the SMP establishes that structures and developments should be located outside of shoreline jurisdiction if possible, and otherwise be no less than 60 feet (**SMP 83.180.3**). As already mentioned, new developments within the parks are not anticipated and redevelopment is not likely to result in structures being located closer to the water's edge than the current condition, so the existing average setback would not change. Several of the parks have streams and wetlands, which have additional protections under **SMP 83.500** and **SMP 83.510**. 1. *Impervious surface* No change in impervious surface requirements are proposed under the new SMP. Based on the redevelopment potential mentioned above, impervious surface areas are not expected to change. 2. *Vegetation/Habitat* As previously mentioned, many of the activities in the parks are intended to improve ecological functions, and would be conducted voluntarily beyond the SMP requirements for mitigation tied to any development. (Note: items 3-9 addressed in Sections 3.5 and 3.6)	Outside of the immediate shoreline zone, short- and long-term stormwater management per the latest Ecology Stormwater Manual would minimize/eliminate construction-related stormwater runoff impacts and may slowly improve the quality of any waters reaching the shoreline. **Non-Regulatory Restoration Actions** The *Final Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan* (WRIA 8 Steering Committee 2005) includes potential restoration of the mouth of Juanita Creek through the removal of bank armoring and returning the mouth to a more natural outlet as Project C296 on the "Lake Washington - Tier I - Initial Habitat Project List." It is identified as a low-priority project, however, because of its limited benefit to chinook salmon and perceived low feasibility. Nevertheless, the City is currently planning to implement this project, including riparian wetland enhancement, as part of its Juanita Beach Park Master Plan. This activity is described in the Shoreline Restoration Plan. The City's Shoreline Restoration Plan includes goals and objectives with an emphasis on public education and involvement intended to promote voluntary shoreline enhancement and restoration on private land. See the Residential – L discussion above for examples. In addition, Projects 2, 6-11, and 15-28 in the Shoreline Restoration Plan (see Table 3) are located in and just waterward of the City's Urban Conservancy-designated parks. Invasive vegetation species management, reductions in overwater cover and inwater structure, reductions in shoreline armoring, and improvements in stormwater discharges would improve shoreline processes and ecological functions for fish and wildlife. (note: effects of pier modifications in the Aquatic environment are more fully evaluated in Section 3.5). The City is also planning to resurface all of its public piers with grated decking, not just because of requirements to do so in **SMP 83.290(3)**, but because of other maintenance and public safety benefits. The City's parks are also maintained using Integrated Pest Management (IPM) techniques, which dramatically minimize the amount of chemical treatments that lawn and landscaping require. Other enhancements to the shoreline parks are possible through Capital Improvement Program funds, which help complete shoreline or stream restoration, install new landscaping, and to implement Low Impact Development (LID) practices. Open Space and Park Land Acquisition Grant Match Program, which assists with or provides funding for acquisition of key sites as they become available. The City's Parks Department also has a number of other partnerships or efforts that will likely result in additional improvements to parks that improve ecological function, including Juanita Bay Park Rangers, Eagle Scout/Capstone Projects, and the Youth Tree Education Program.
Urban Mixed			
The shoreline within the Urban Mixed environment is comprised of a variety of uses including park/open space, residential, and commercial. In general, the land area is fully developed.	**FUTURE DEVELOPMENT** in the Urban Mixed environment will likely be restricted to redevelopment of two waterfront properties, and implementation of the Urban Mixed portion of Juanita Beach Park Master	Several facets of the SMP development standards for the Urban Mixed environment are aimed at minimizing potential impacts to shoreline ecological functions that are discussed in Sections 3.3, 3.5, and 3.6. Structure setbacks are one of the key components to assess overall	**Other Regulatory Programs:** Any in- or over-water proposals, primarily piers and shoreline reconstruction, would require review not only by the City of Kirkland, but also by the WDFW, the U.S. Army Corps of Engineers (Corps), and/or Ecology. Each of these agencies is charged with regulating and/or protecting streams, lakes, and wetlands, and would impose certain design or mitigation requirements on applicants. Due to Endangered Species Act consultation requirements with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, the Corps has developed recommendations to minimize project impacts.

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
	Plan. Although some change in use may occur from property to property, no net change in functional uses are anticipated throughout the Urban Mixed environment. **FUNCTIONS/PROCESSES IMPACTED:** The functions and processes potentially affected by future development within the Urban Mixed environment are very similar to those described above for the Residential – L environment. However, given the existing built out condition (impervious surfaces already total over 56 percent of the total shoreline jurisdiction for Urban Mixed) and the maintenance of the existing setback, impacts on ecological functions from future expansion are anticipated to be less. Regardless, development impacts may include: 1. *Impervious surface alterations* 2. *Vegetation alteration* 3. *Chemical contaminant alterations* 4. *External lighting impacts* 5. *Growth of aquatic vegetation* 6. *Juvenile salmon migration and behavior* 7. *Sediment movement* 8. *Chemical contamination* 9. *External lighting impacts on overwater structures* 10. *Shoreline complexity* 11. *Wave attenuation*	impacts to ecological function as they relate to many of the items listed below. Structure setbacks are regulated under **SMP 83.180** and **SMP 83.380**. Under these scenarios and an anticipated redevelopment of up to 2 lots, the median setback would remain the same (~29 feet) and the average setback would actually increase from approximately 38 to approximately 40 feet. See discussion above under Residential – L environment for expanded details as to how the SMP Provisions address the following impacts. 1. *Impervious surface alterations* In the Urban Mixed environment, allowed impervious surface has been slightly decreased for waterfront lots in order to recognize the area devoted to the shoreline riparian planting required under **SMP 83.400**. Based on the redevelopment potential mentioned above, approximately 0 acres of land area between existing primary structures and the water's edge would become impervious while 0.04 acre of nearshore area would be revegetated with native plants. Stormwater provisions are included in **SMP 83.480**. Additional impact reductions are listed in **SMP 83.380**. 2. *Vegetation alteration* Retention of existing vegetation is regulated by **SMP 83.400**. For the Urban Mixed environment, this also requires an average of 10 feet of riparian vegetation planted from the OHWM (**SMP 83.400(1)(d)(1)**). Removal of significant trees in the setback shall be mitigated at a 3:1 ratio. 3. *Chemical contaminant increases* Shoreline setback reduction alternatives (**SMP 83.380**) include landscape best management practices and may limit lawn area. 4. *External lighting impacts* Lighting shall be controlled to minimize adverse effects on fish and wildlife and their habitats (**SMP 83.470**). However, several exemptions from the lighting standards are	These include Regional General Permit 3 (RGP-3) for overwater structures and a Programmatic Biological Evaluation for shoreline stabilization. WDFW also follows similar design standards as the Corps and the City of Kirkland has included many of these standards within the proposed SMP. These agencies would also impose certain design and mitigation requirements on a proposed project to minimize adverse impacts. Outside of the immediate shoreline zone, short- and long-term stormwater management per the latest Ecology Stormwater Manual would minimize/eliminate construction-related stormwater runoff impacts and may slowly improve the quality of any waters reaching the shoreline. **Non-Regulatory Restoration Actions** The City's Shoreline Restoration Plan includes goals and objectives with an emphasis on public education and involvement intended to promote voluntary shoreline enhancement and restoration on private land. See the Residential – L discussion above for examples. In addition, Projects 1 and 12-14 in the Shoreline Restoration Plan (see Table 3) are located in and just waterward of Juanita Beach Park or Marina Park. Reductions in overwater cover and inwater structure and reductions in shoreline armoring would improve shoreline processes and ecological functions for fish and wildlife. (note: effects of pier modifications in the Aquatic environment are more fully evaluated in Section 3.5). The City is also planning to resurface all of its public piers with grated decking, not just because of requirements to do so in **SMP 83.290(3)**, but because of other maintenance and public safety benefits. The City's parks are also maintained using Integrated Pest Management (IPM) techniques, which dramatically minimize the amount of chemical treatments that lawn and landscaping require. Other enhancements to the shoreline parks are possible through Capital Improvement Program funds, which help complete shoreline or stream restoration, install new landscaping, and to implement Low Impact Development (LID) practices.

Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Regulatory Programs and Non-Regulatory Restoration Actions
		included, such as emergency lighting, public rights-of-way (i.e. trails), and seasonal lighting (**SMP 83.470(2)(a)**). (Note: items 5-11 addressed in Sections 3.5 and 3.6)	
Natural			
The shoreline within the Natural environment is entirely park/open space with no existing development, containing only 1 percent impervious surface. It is comprised entirely of the Yarrow Bay wetlands and Juanita Bay Park and Forbes Creek wetland corridors.	**FUTURE DEVELOPMENT** in the Natural environment will be very limited. As discussed above in Section 3.4, the "vacant' lots are all either public property managed for parks and open space, or are lots highly encumbered (in several cases completely) by wetlands. No change in uses is anticipated. **FUNCTIONS/PROCESSES IMPACTED**: Activities anticipated to occur within the Natural environment are almost exclusively related to management of invasive vegetation, installation of native plantings, and perhaps some improvements to public trails. *1. Vegetation/habitat*	Several facets of the SMP development standards for the Natural environment are aimed at minimizing potential impacts to shoreline ecological functions that are discussed in Sections 3.4, 3.5, and 3.6 above. Setbacks are not a relevant issue in the Natural environment, as no new structures, other than potentially public trails, will ever be proposed. Most of the Natural environment consists of streams and wetlands, which have additional protections under **SMP 83.500** and **SMP 83.510**. *1. Vegetation/Habitat* As previously mentioned, many of the activities in the parks are intended to improve ecological functions, and would be conducted voluntarily beyond the SMP requirements for mitigation tied to development.	**Other Regulatory Programs:** Any in- or over-water proposals, primarily piers and shoreline reconstruction, would require review not only by the City of Kirkland, but also by the WDFW, the U.S. Army Corps of Engineers (Corps), and/or Ecology. Each of these agencies is charged with regulating and/or protecting streams, lakes, and wetlands, and would impose certain design or mitigation requirements on applicants. Due to Endangered Species Act consultation requirements with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, the Corps has developed recommendations to minimize project impacts. These include Regional General Permit 3 (RGP-3) for overwater structures and a Programmatic Biological Evaluation for shoreline stabilization. WDFW also follows similar design standards as the Corps and the City of Kirkland has included many of these standards within the proposed SMP. These agencies would also impose certain design and mitigation requirements on a proposed project to minimize adverse impacts. Outside of the immediate shoreline zone, short- and long-term stormwater management per the latest Ecology Stormwater Manual would minimize/eliminate construction-related stormwater runoff impacts and may slowly improve the quality of any waters reaching the shoreline. **Non-Regulatory Restoration Actions** The City's Shoreline Restoration Plan includes goals and objectives with an emphasis on public education and involvement intended to promote voluntary shoreline enhancement and restoration on private land. See the Residential – L discussion above for examples. In addition, Projects 3-5 and 29 in the Shoreline Restoration Plan (see Table 3) are located in and just waterward of Juanita Bay Park or Yarrow Bay Wetlands. Invasive vegetation species management and possible reductions in overwater cover and inwater structure would improve ecological functions for fish and wildlife. (note: effects of pier modifications in the Aquatic environment are more fully evaluated in Section 3.5). The City's parks are also maintained using Integrated Pest Management (IPM) techniques, which dramatically minimize the amount of chemical treatments that lawn and landscaping require. Other enhancements to the shoreline parks are possible through Capital Improvement Program funds, which help complete shoreline or stream restoration, install new landscaping, and to implement Low Impact Development (LID) practices. The Open Space and Park Land Acquisition Grant Match Program, which assists with or provides funding for acquisition of key sites as they become available, may be used to purchase additional private parcels located in wetlands associated with Yarrow Bay Park. The City's Parks Department also has a number of other partnerships or efforts that will likely result in additional improvements to parks that improve ecological function, including Juanita Bay Park Rangers, Eagle Scout/Capstone Projects, and the Youth Tree Education Program.

8 NET EFFECT ON ECOLOGICAL FUNCTION

Table 17 above examines development and redevelopment potential by environment designation, except for piers and shoreline armoring which are addressed collectively in Section 3.5 and 3.6. It is clear from Table 17 that the City is already highly developed, and has limited potential for new development on just a few vacant lots. A large number of other vacant lots are encumbered by wetlands and are not expected to be developed. The vacant lots with potential for new development are vegetated, and even contain a few trees, but much of the vegetation is invasive and the lots are so narrow that their habitat value is quite limited by the proximity of roads and other developments.

Collectively, the redevelopment potential may shift development closer to the water's edge, but the condition of the remaining space will be improved overall by installations of native landscaping and compliance with lighting standards. Further, the allowances for non-structural developments in the setbacks are more limited than the existing condition. In the long term, impervious surfaces currently located in the existing and proposed setbacks may be removed.

The effective overwater coverage (but not the actual footprints) should also decrease over the next 20 years, even with installation of new piers and pier additions. Because of the increased requirements to demonstrate need for new shoreline armoring and the requirements to consider soft solutions for new and replacement shoreline armoring, the City's overall shoreline hardening condition will at worst remain the same, and realistically will improve over time.

Potential for improvement of shoreline ecological functions is currently greatest on City park properties, with substantial conversions of solid to grated decking, installation of native vegetation and removal of invasive vegetation, restoration of wetlands and a stream, and enhancement of currently armored shoreline.

Even without implementation of the Restoration Plan, the proposed Shoreline Master Program should result in maintenance of the current level of ecological function, and possibly even improvements over time. However, when paired with the Restoration Plan, ecological function of the City's Lake Washington shoreline is certain to improve.

Therefore, **no net loss of shoreline ecological functions is anticipated.**

9 REFERENCES

Longcore, T. and C. Rich. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment. 2(4):191-198

Mazur, M. and D. Beauchamp. 2006. Linking piscivory to spatial-temporal distributions of pelagic prey fishes with a visual foraging model. Journal of Fish Biology.

Rich, C. and T. Longcore. 2006. Ecological Consequences of Artificial Night Lighting. Island Press. Washington.

The Watershed Company. 2006. Final Shoreline Analysis Report Including Shoreline Inventory and Characterization for the City of Kirkland's Lake Washington Shoreline. Prepared for City of Kirkland.

10 LIST OF ACRONYMS AND ABBREVIATIONS

Corps ..... U.S. Army Corps of Engineers

Ecology ..... Washington Department of Ecology

OHWM..... ordinary high water mark

SMP..... Shoreline Master Program

WDFW..... Washington Department of Fish and Wildlife

APPENDIX A – ENVIRONMENT DESIGNATION MAPS

Figure Xa

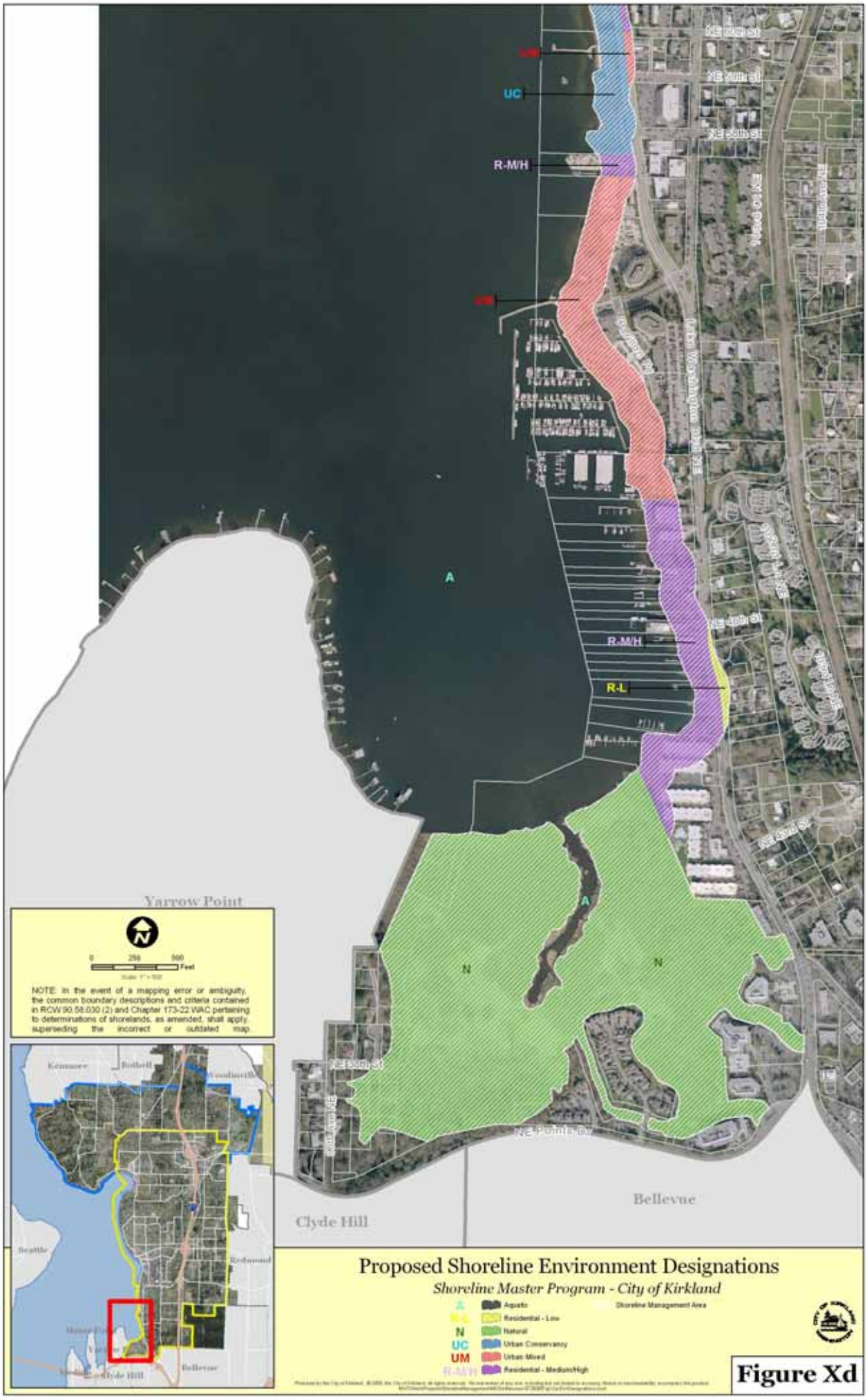
Attachment 8
Public Hearing 7/27/09

Figure Xb

Attachment 8
Public Hearing 7/27/09

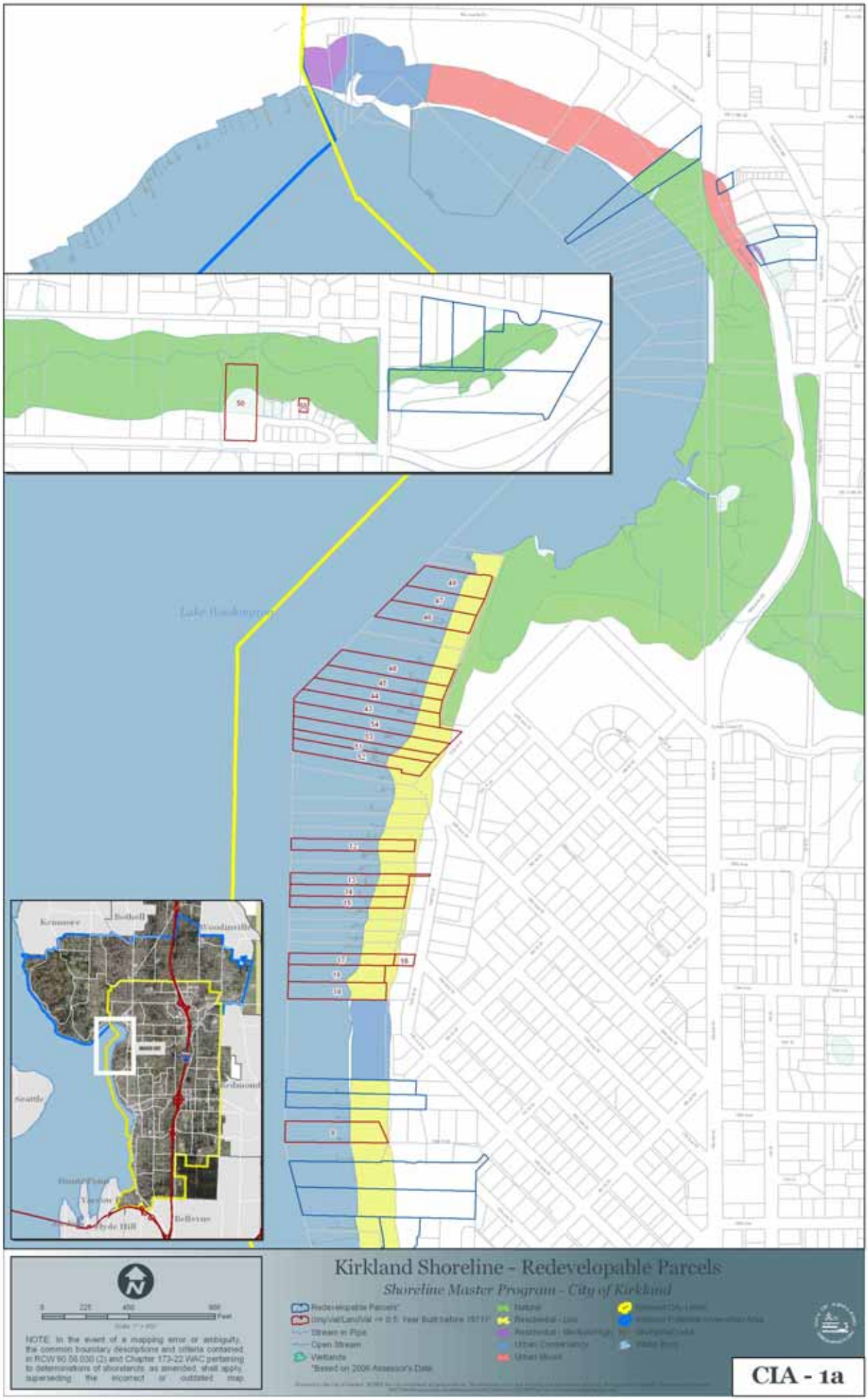
Figure Xc

Attachment 8
Public Hearing 7/27/09

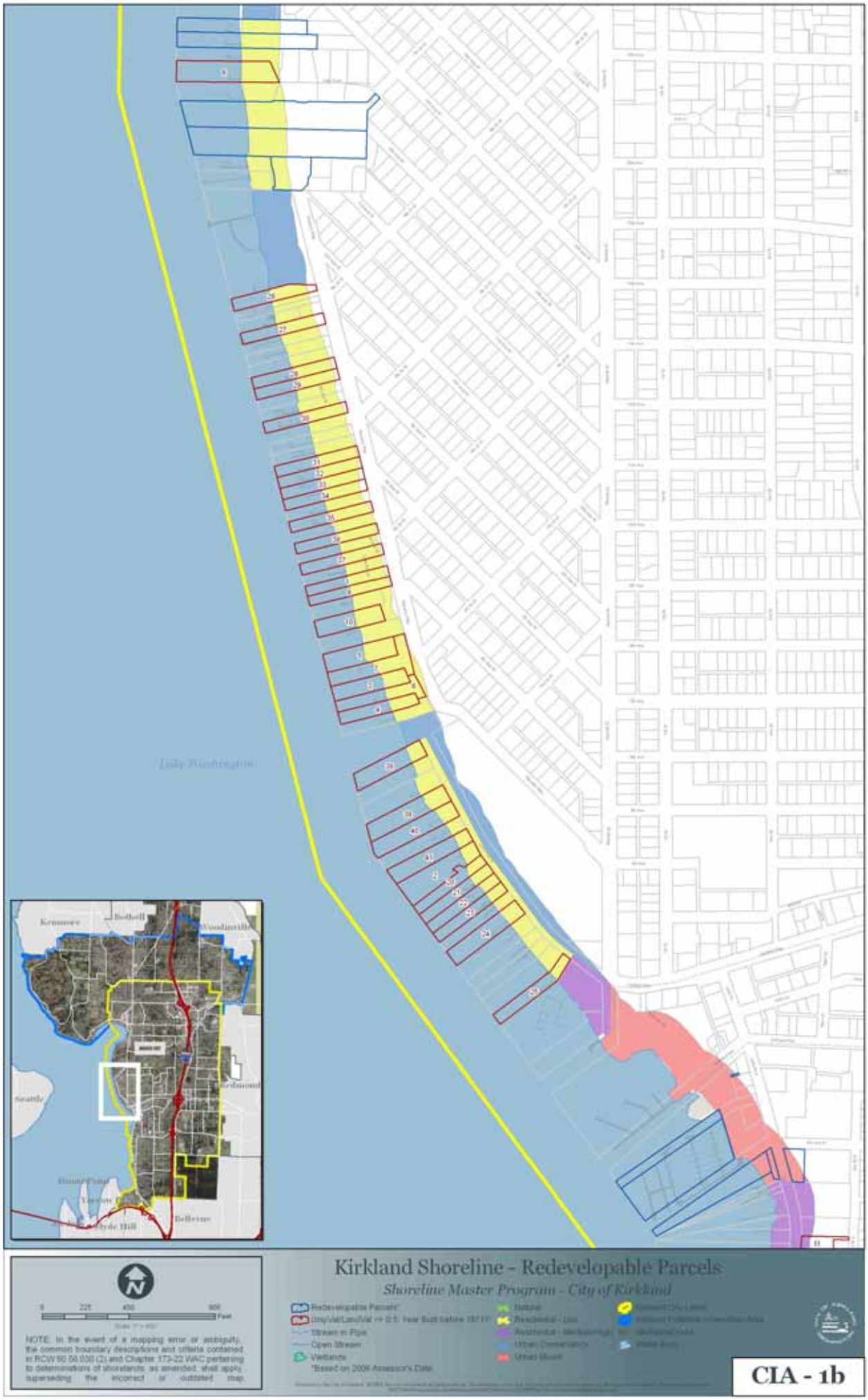


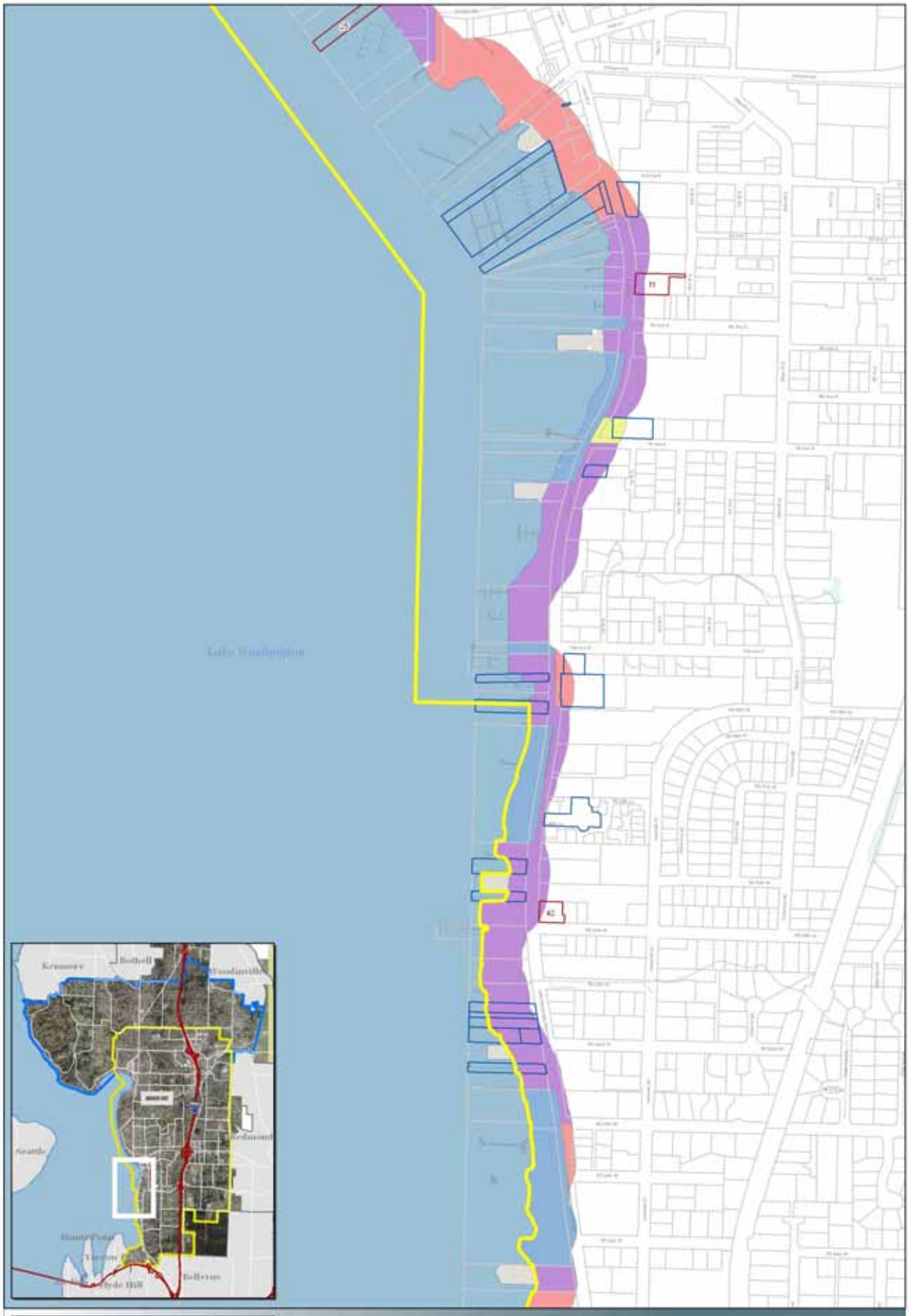
Attachment 8
Public Hearing 7/27/09

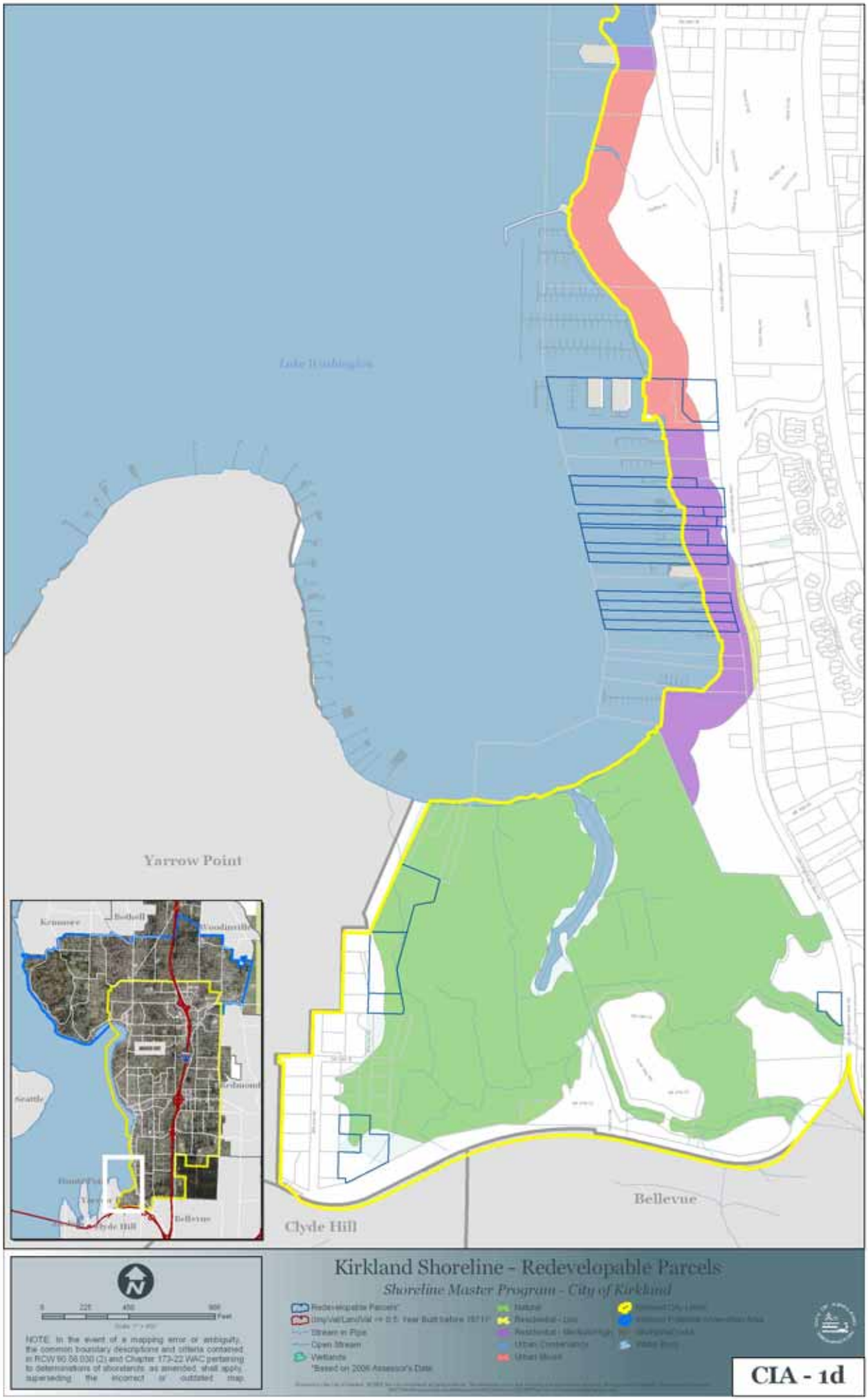
APPENDIX B – FIGURES



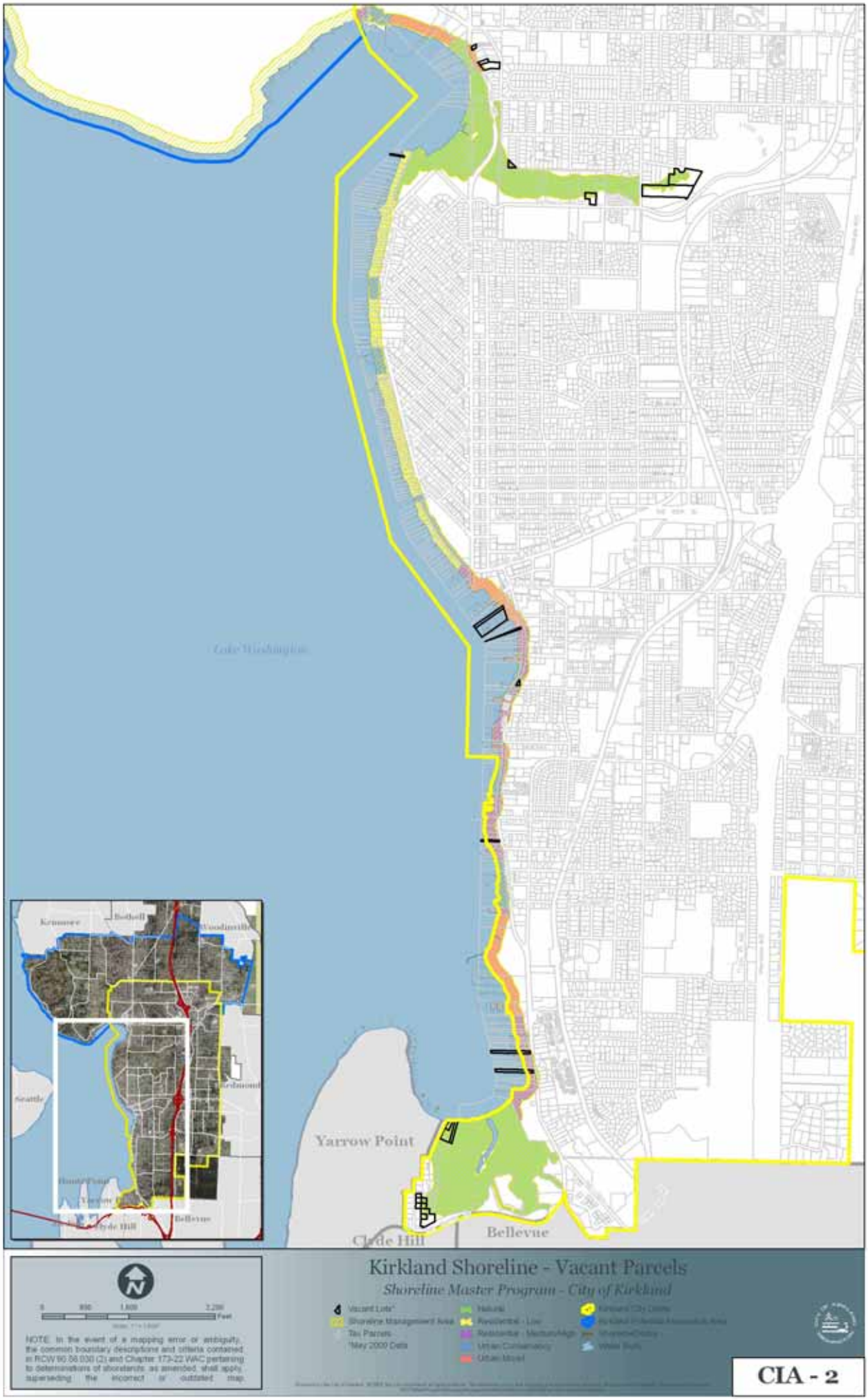
Attachment 8
Public Hearing 7/27/09


Kirkland Shoreline - Redevelopable Parcels
Shoreline Master Program - City of Kirkland
Redevelopable Parcels*
Stream in Pipe
Open Stream
Wetlands
*Based on 2006 Assessor's Data
Natural
Residential - Low
Urban Conservancy
Urban Mixed
0 225 450 900 Feet
NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.
CIA - 1b

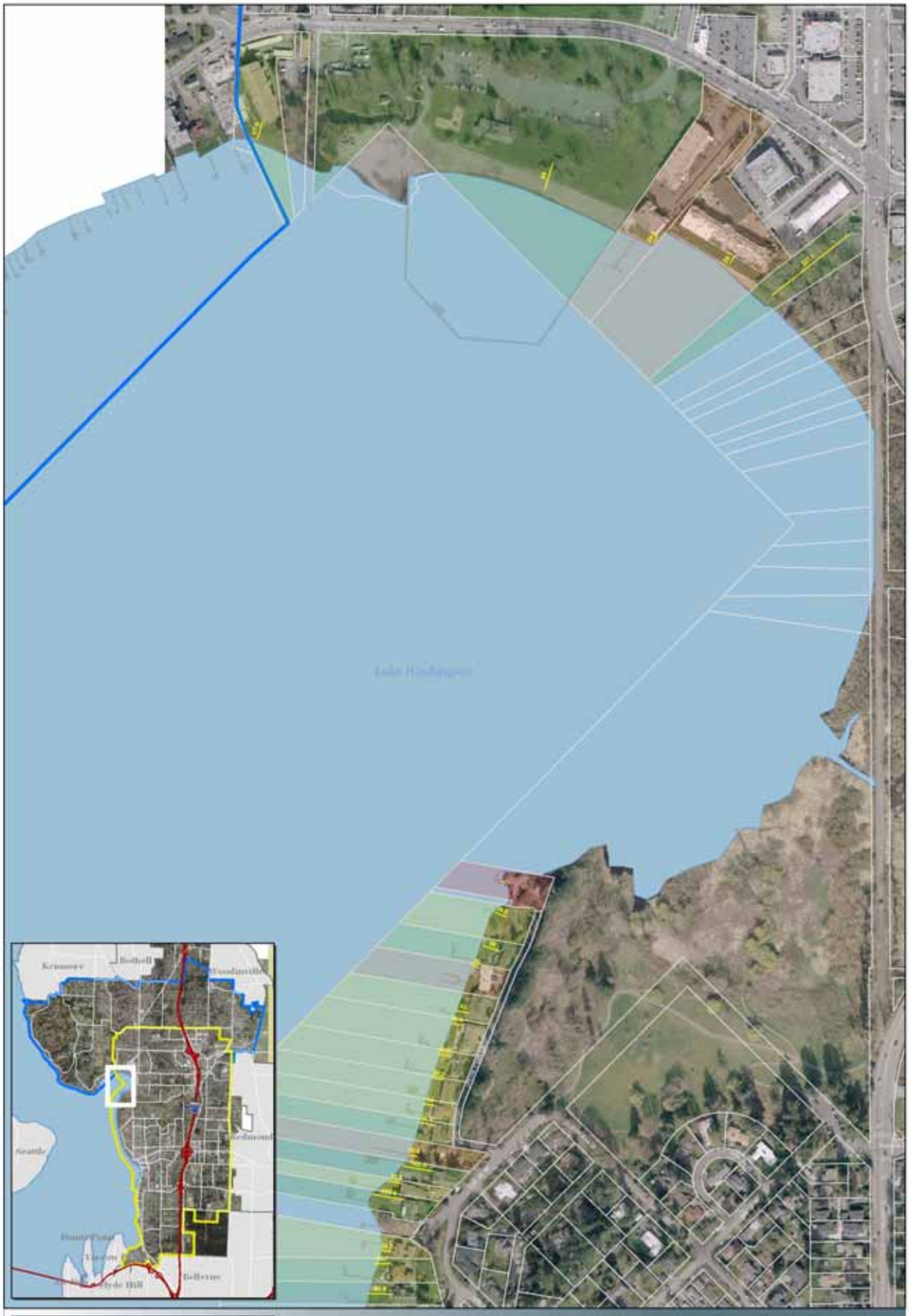

Lake Washington
Kirkland Shoreline - Redevelopable Parcels
Shoreline Master Program - City of Kirkland
Redevelopable Parcels*
Stream in Pipe
Open Stream
Wetlands
*Based on 2006 Assessor's Data
Natural
Residential - Low
Urban Conservancy
Urban Mixed
0 225 450 900 Feet
NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.
CIA - 1c



Attachment 8
Public Hearing 7/27/09



Attachment 8
Public Hearing 7/27/09



Attachment 8
Public Hearing 7/27/09

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

Kirkland Shoreline - Existing Primary Structure Setbacks

Shoreline Master Program - City of Kirkland

Primary Structure Setback Distance

- 0.1 - 15.0
- 15.1 - 30.0
- 30.1 - 45.0
- 45.1 - 60.0
- 60.1 - 327.0

Primary Structure Setback Measurement

Kirkland City Limits

Kirkland Potential Annexation Area

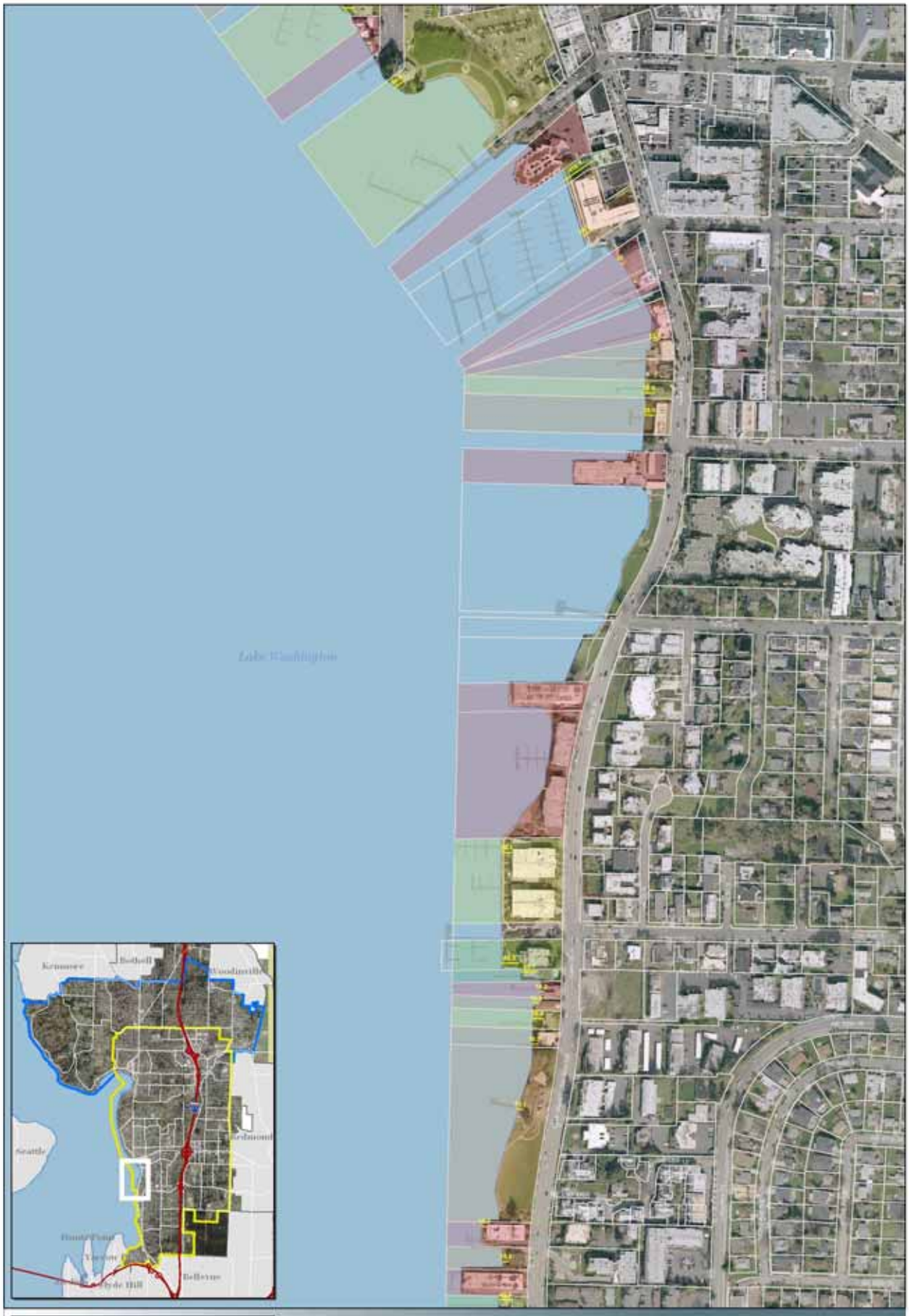
Shoreline Centers

Water Body

CIA - 3b

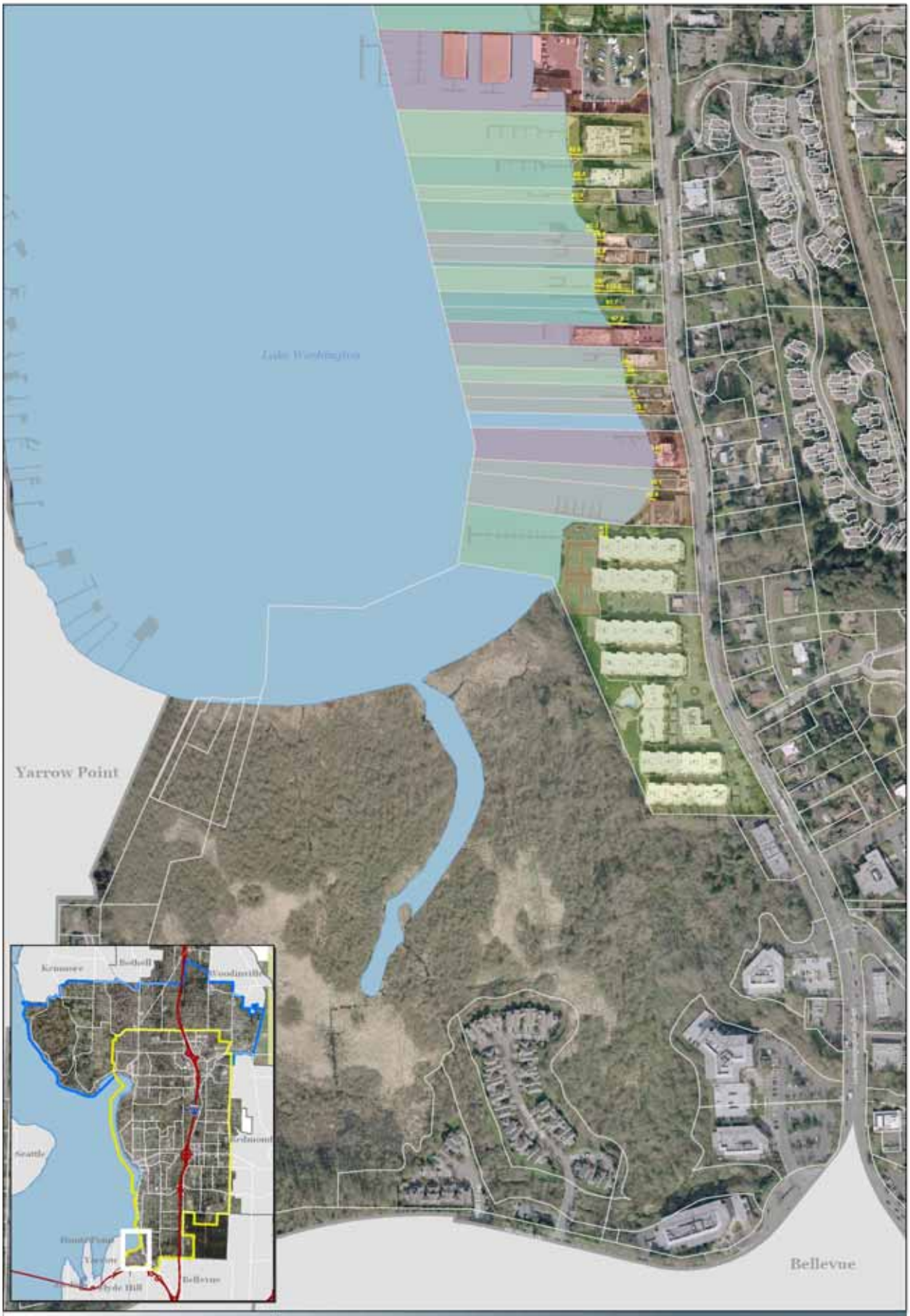
Attachment 8
Public Hearing 7/27/09

Attachment 8
Public Hearing 7/27/09



Attachment 8
Public Hearing 7/27/09

Attachment 8
Public Hearing 7/27/09



Kirkland Shoreline - Existing Primary Structure Setbacks

Shoreline Master Program - City of Kirkland

Primary Structure Setback Distance

- 0.1 - 15.0
- 15.1 - 30.0
- 30.1 - 45.0
- 45.1 - 60.0
- 50.1 - 327.0

Primary Structure Setback Measurement

Kirkland City Limits

Adopted Potential Annexation Area

Shoreline Centers

Water Body

0 150 300 600 Feet

Scale 1" = 300'

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

CIA - 3f

Attachment 8
Public Hearing 7/27/09

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

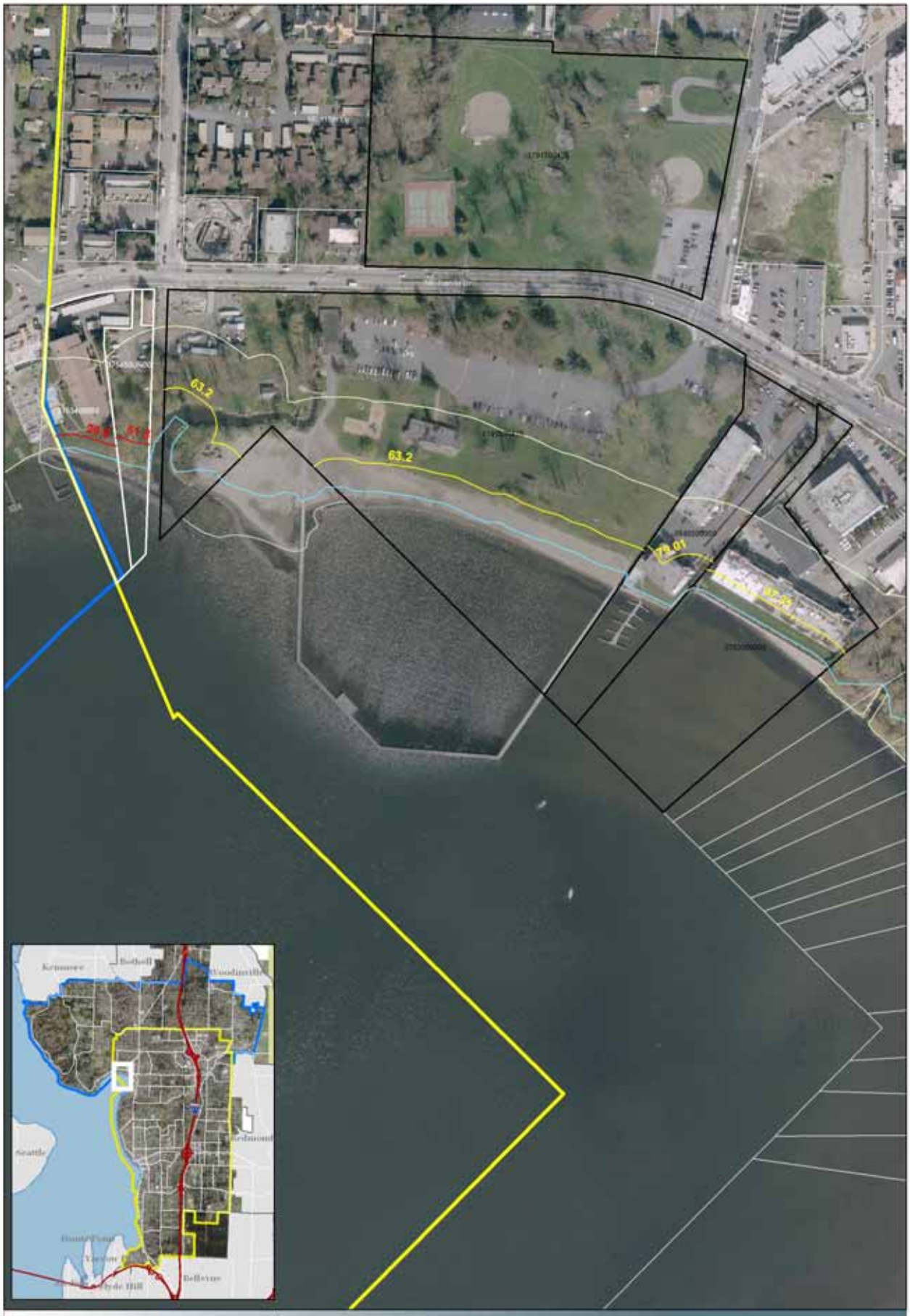
Shoreline Setback Regulation for Lake Ave West R-L Area - Average of Adjacent Existing Primary Structure Setback

Shoreline Master Program - City of Kirkland

Average Primary Structure Setback
Shoreline Management Area
Sanitary Sewer Pipe
Ordinary High Water Mark
R-L Parcels
Tax Parcels
Kirkland City Limits
Kirkland Potential Annexation Area

CIA - 4

Attachment 8
Public Hearing 7/27/09



NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

Shoreline Setback Regulation for R-M/H and UM Environments - 15% Average Parcel Depth w/ 25' Minimum

Shoreline Master Program - City of Kirkland

R-M/H Setbacks
25' Minimum Setback
15% Average Lot Depth
R-M/H Parcels
UM Setbacks
25' Minimum Setback
15% Average Lot Depth
UM Parcels
C3
Shoreline Management Area
Delineation High Water Mark
Kirkland City Limits
Kirkland FAA

CIA - 5a

Attachment 8
Public Hearing 7/27/09

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

Shoreline Setback Regulation for R-M/H and UM Environments - 15% Average Parcel Depth w/ 25' Minimum

Shoreline Master Program - City of Kirkland

R-M/H Setbacks
25' Minimum Setback
15% Average Lot Depth
R-M/H Parcels

UM Setbacks
25' Minimum Setback
15% Average Lot Depth
UM Parcels

C3

CIA - 5b

Attachment 8
Public Hearing 7/27/09

Attachment 8
Public Hearing 7/27/09

Shoreline Setback Regulation for R-M/H and UM Environments - 15% Average Parcel Depth w/ 25' Minimum

Shoreline Master Program - City of Kirkland

0 100 200 400 Feet

Scale 1" = 200'

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

R-M/H Setbacks
25' Minimum Setback
15% Average Lot Depth
R-M/H Parcels

UM Setbacks
25' Minimum Setback
15% Average Lot Depth
UM Parcels

C3 Shoreline Management Area
Ordinary High Water Mark
Kirkland City Limits
Kirkland PAA

CIA - 5d

Attachment 8
Public Hearing 7/27/09

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

Shoreline Setback Regulation for R-M/H and UM Environments - 15% Average Parcel Depth w/ 25' Minimum

Shoreline Master Program - City of Kirkland

R-M/H Setbacks
25' Minimum Setback
15% Average Lot Depth
R-M/H Parcels
UM Setbacks
25' Minimum Setback
15% Average Lot Depth
UM Parcels
C3 Shoreline Management Area
Ordinary High Water Mark
Kirkland City Limits
Kirkland PAA

CIA - 5e

Attachment 8
Public Hearing 7/27/09

Attachment 8
Public Hearing 7/27/09

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

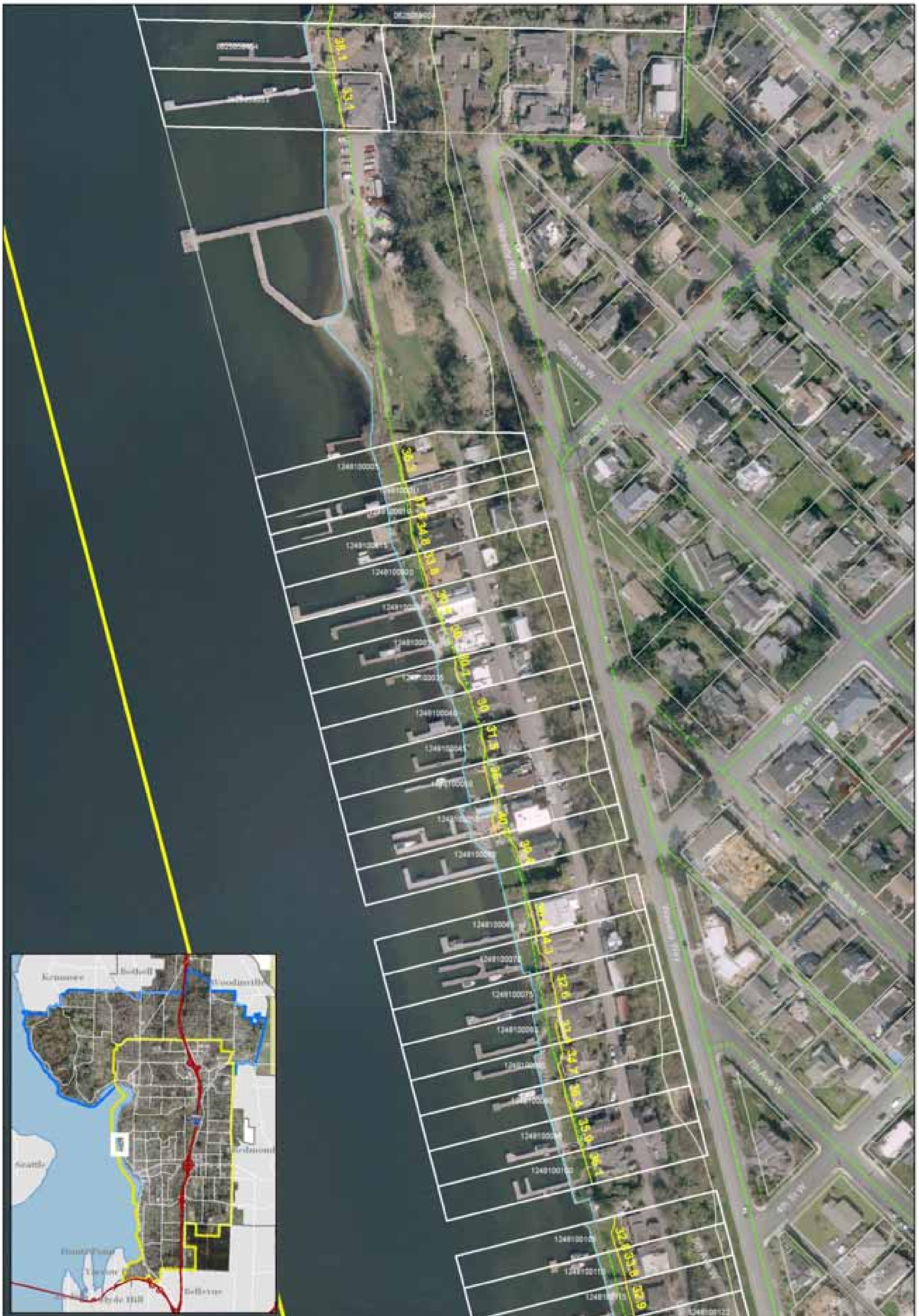
Shoreline Setback Regulation for R-L Environment (not including Lake Ave W area) - 30% Average Parcel Depth (30' Min / 60' Max)

Shoreline Master Program - City of Kirkland

30' Minimum Setback
30% Average Lot Depth
60' Maximum Setback
Shoreline Management Area
Ordinary High Water Mark
R-L Parcels
Tax Parcels
Adjacent City Limits
Adjacent PAA

CIA - 6b

Attachment 8
Public Hearing 7/27/09



Shoreline Setback Regulation for R-L Environment (not including Lake Ave W area) - 30% Average Parcel Depth (30' Min / 60' Max)

Shoreline Master Program - City of Kirkland

0 75 150 300 Feet

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

30' Minimum Setback
30% Average Lot Depth
60' Maximum Setback
Shoreline Management Area
Ordinary High Water Mark
R-L Parcels
Kirkland City Limits

CIA - 6c

NOTE: In the event of a mapping error or ambiguity, the common boundary descriptions and criteria contained in RCW 90.58.030 (2) and Chapter 173-22 WAC pertaining to determinations of shorelands, as amended, shall apply, superseding the incorrect or outdated map.

Shoreline Setback Regulation for R-L Environment (not including Lake Ave W area) - 30% Average Parcel Depth (30' Min / 60' Max)

Shoreline Master Program - City of Kirkland

30' Minimum Setback
30% Average Lot Depth
60' Maximum Setback
Shoreline Management Area
Ordinary High Water Mark
R-L Parcels
Tax Parcels
Adjacent City Limits
Adjacent PAA

CIA - 6d

Attachment 8
Public Hearing 7/27/09

APPENDIX C – PIER ANALYSIS

The Watershed Company
June 2009

New Single-Family Overwater Structures	
Total # of new single-family piers possible (5 SF at 600 and 1 joint-use at 820)	6
Total square footage estimated for new single-family pier (fully grated)	600
Total square footage estimated for new joint-use pier (fully grated)	820
Total new square footage for new piers	3,820
Total new effective overwater square footage (40% open space)	2,292
Total effective square footage of overwater cover for new single-family piers	**2,292**

Replacement of Single-Family Overwater Structures	
Total # of existing single-family piers	111
Percentage of piers to be replaced	20%
Total # of piers to be replaced	22
Average replacement pier size (assumes piers to be rebuilt at same size as existing, but fully grated)	841
Total square footage fully grated	841
Total square footage of replacement piers (same as existing footage)	18,677
Total replacement square footage with grating	18,677
Effective overwater coverage of replacement piers (40% open space)	11,206
Effective reduction in overwater coverage as result of replacement	**7,471**

Repair of Single-Family Overwater Structures	
Total # of existing single-family structures	111
Percentage of existing piers to be replaced with grated decking in nearshore 30 feet (240 sf/pier)	30%
Total square footage of decking to be replaced with grating	7,992
Effective overwater coverage of replaced decking (40% open space)	4,795
Effective reduction in overwater coverage as result of repair	**3,197**

Additions to Single-Family Overwater Structures	
Percent of existing piers expected to propose additions	10%
Total square footage estimated for new additions (50'x4' for each addition)	2,220
Total square footage fully grated	2,220
Total new effective overwater cover (40% open space)	1,332
Effective increase in overwater coverage for additions	**1,332**

Total square footage of existing pier	93,384
Reduction of effective overwater cover based on repairs	-3,197
Increase in effective overwater cover based on new piers	2,292
Increase in effective overwater cover based on pier additions	1,332
Reduction in effective overwater cover based on replacements	-7,471
TOTAL FINAL EFFECTIVE OVERWATER COVER	**86,340**
NET CHANGE IN EFFECTIVE OVERWATER COVER	**-7,044**

Repair of Multi-Family Overwater Structures	
Total # of existing multi-family structures	25
Total square footage of structures	59,867
Average square footage of multi-family structures	2,395
Percentage of existing piers to be replaced with grated decking in nearshore 30 feet (240 sf/pier)	5%
Total square footage of decking to be replaced with grating	300

Effective overwater coverage of replaced decking (40% open space)	180
Effective reduction in overwater coverage as result of repair	**120**

New Multi-Family Overwater Structures

Total # of new multi-family piers possible	5
Total square footage estimated for new community pier	2,000
Total square footage fully grated	2,000
Total new square footage for new piers	10,000
Total new effective overwater square footage (40% open space)	6,000
Total square footage of non-grated section	4,000
Total effective square footage of overwater cover for new multi-family piers	**6,000**
Total square footage of existing multi-family piers	59,867
Reduction of effective overwater cover based on repairs	-120
Increase in effective overwater cover based on new piers	6,000
TOTAL FINAL EFFECTIVE OVERWATER COVER	**65,747**
NET CHANGE IN EFFECTIVE OVERWATER COVER	**5,880**

Repair of Commercial Overwater Structures

Total # of existing commercial structures	11
Total square footage of structures	133,516
Average square footage of commercial structures	12,138
Percentage of existing piers to be replaced with grated decking in nearshore 30 feet (240 sf/pier)	30%
Total square footage of decking to be replaced with grating	792
Effective overwater coverage of replaced decking (40% open space)	475
Effective reduction in overwater coverage as result of repair	**317**
Total square footage of existing commercial piers	133,516
Reduction of effective overwater cover based on repairs	-317
TOTAL FINAL EFFECTIVE OVERWATER COVER	**133,199**
NET CHANGE IN EFFECTIVE OVERWATER COVER	**-317**

Repair of Public Overwater Structures

Total # of existing public structures	9
Total square footage of structures	32,218
Average square footage of public structures	3,580
Percentage of existing decking to be replaced with grated decking	100%
Total square footage of decking to be replaced	32,218
Effective overwater coverage of replaced decking (40% open space)	19,331
Effective reduction in overwater coverage as result of repair	**12,887**

Additions to Public Overwater Structures

Total # of additions to piers possible	2
Total square footage estimated for new additions	2,482
Total square footage fully grated	2,482
Total new effective overwater cover (40% open space)	1,489
Effective increase in overwater coverage for additions	**1,489**

Total square footage of existing public piers	32,218
Reduction of effective overwater cover based on repairs	-12,887
Increase in effective overwater cover based on additions	1,489
TOTAL FINAL EFFECTIVE OVERWATER COVER	**20,820**
NET CHANGE IN EFFECTIVE OVERWATER COVER	**-11,398**

Existing Overwater Coverage	
Total existing overwater coverage - single-family	93,384
Total existing overwater coverage - multi-family	59,867
Total existing overwater coverage - commercial	133,516
Total existing overwater coverage - public	32,218
Total existing overwater coverage (square footage)	**318,985**

Effective Overwater Coverage at Buildout	
Total overwater cover at buildout - single-family	86,340
Total overwater cover at buildout - multi-family	65,747
Total overwater cover at buildout - commercial	133,199
Total overwater cover at buildout - public	20,820
Total effective overwater coverage at buildout (square footage)	**306,107**

Change in Effective Overwater Coverage at Buildout	
Net change in overwater cover - single-family	-7,044
Net change in overwater cover - multi-family	5,880
Net change in overwater cover - commercial	-317
Net change in overwater cover - public	-11,398
TOTAL CHANGE IN EFFECTIVE OVERWATER COVER AT BUILDOUT	**-12,878**
PERCENTAGE DECREASE IN OVERWATER COVER AT BUILDOUT	**-4.0%**

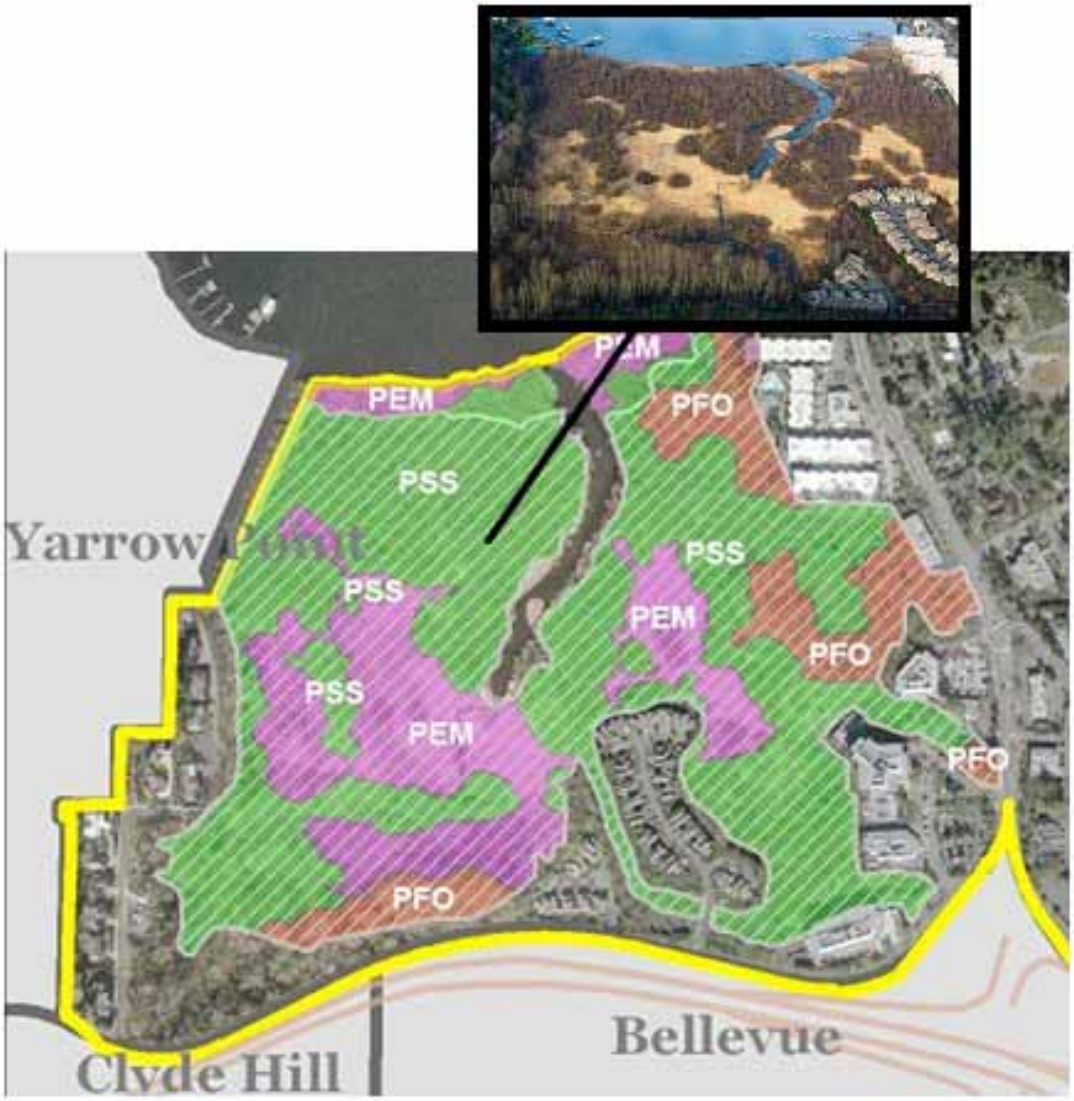
APPENDIX D – VEGETATION DETAILS

Vegetation Detail
Juanita Bay Wetland

Vegetation Detail
Residential - L Environment

Vegetation Detail
Urban Mixed Environment

Vegetation Detail
Residential - M/H Environment



Vegetation Detail
Yarrow Bay Wetlands