

FINAL SHORELINE INVENTORY, ANALYSIS, AND CHARACTERIZATION REPORT

RICHLAND SHORELINE MASTER PROGRAM UPDATE

Prepared for

City of Richland



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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background and Purpose	1
1.2	Report Organization.....	1
2	REGULATORY OVERVIEW	3
2.1	Shoreline Management Act	3
2.2	Local, State, and Federal Plans and Regulations.....	3
2.3	Cultural Resources and Shoreline Development	6
3	SHORELINE JURISDICTION ANALYSIS	7
3.1	Shoreline Master Program Jurisdiction Determination Methodology	8
3.2	Study Area	9
3.3	Reach Breaks.....	9
4	RICHLAND OVERVIEW	12
4.1	Ownership and Land Cover	12
4.2	Land Use	13
4.2.1	Citywide Existing Land Use	13
4.2.2	Current Citywide Land Use	13
4.2.3	Water-dependent Uses	17
4.2.4	Water-related Uses	17
4.2.5	Non-water-related uses	17
4.2.6	Future Land Use	17
4.3	Current SMP Environment Designation	18
4.3.1	Natural	18
4.3.2	Conservancy	18
4.3.3	Rural	19
4.3.4	Urban	19
4.4	Geology	19
4.5	Climate	20
4.6	Water Resources	20
4.6.1	Surface Water Resources	20
4.6.2	Surface Water Quality	22

4.6.3	Groundwater Resources	23
4.6.4	Floodplain and Floodway	23
4.6.5	Channel Migration Zone	24
4.7	Geologic Hazards	24
4.8	Cultural Resources	24
4.8.1	Historical Background	24
4.8.2	Recorded Cultural and Historical Resources	27
4.8.3	Potential for Archaeological and Historic Resources	29
4.8.4	Cultural Resources and Shoreline Development	30
5	SHORELINE INVENTORY, ANALYSIS, AND CHARACTERIZATION	31
5.1	Ecosystem-wide Processes and Conditions in Richland	31
5.1.1	Hydrology	31
5.1.2	Sediment	32
5.1.3	Water Quality	35
5.1.4	Habitat	36
5.2	Reach Characterizations	46
6	PUBLIC ACCESS	48
7	INFORMATION SOURCES, ASSUMPTIONS, AND LIMITATIONS	49
8	REFERENCES	50

List of Tables

Table 1	Critical Areas Regulation Summary (as of 2013)	5
Table 2	Yakima and Columbia River Reaches	10
Table 3	Ownership Types within City Limits and UGA	12
Table 4	Land Cover Types within City Limits and UGA	12
Table 5	Shoreline and Land Uses Summary Characteristics by Reach	15
Table 6	Parcels Summary Characteristics by Reach	16
Table 7	Recorded Cultural and Historical Resources within 1,000 Feet of the Shoreline in the Richland Area, by Reach	28

List of Appendices

Appendix A Reach Characterization Tables

Appendix B Map Folio

LIST OF ACRONYMS AND ABBREVIATIONS

%	percent
°C	degrees Celsius
ALEP	Arid Lands Ecology Preserve
BLM	U.S. Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
City	City of Richland
CRB	Columbia River Basalt
DAHP	Washington State Department of Archaeology and Historic Preservation
DART	Data Access in Real Time
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HPA	Hydraulic Project Approval
HRNM	Hanford Reach National Monument
Integrated Plan	Integrated Water Resource Management Plan
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SR	State Route
TMDL	total maximum daily load
UGA	urban growth area
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WSU	Washington State University

1 INTRODUCTION

1.1 Background and Purpose

The City of Richland (City) received grant funding from the Washington State Department of Ecology (Ecology) to develop an updated Shoreline Master Program (SMP). A primary purpose of this effort is to update the SMP to comply with Chapter 90.58 Revised Code of Washington (RCW), the Shoreline Management Act (SMA), and Ecology’s 2003 Shoreline Master Program Guidelines (Chapter 173-26 Washington Administrative Code [WAC]).

The Inventory, Analysis, and Characterization Report is a foundational step for the SMP. This report includes a discussion of the setting and ecosystem-wide processes that influence ecological functions within Richland shorelines. The report also addresses alterations based on existing land use patterns and future potential development within the shoreline jurisdiction areas. Inventory, analysis and characterization tables summarizing conditions by reach for the Yakima and Columbia Rivers are provided in Appendix A. A map folio is provided in Appendix B.

The guidelines require the City to demonstrate that the SMP will result in “no net loss” to shoreline ecological functions during implementation. This report will serve to describe the existing baseline conditions of shoreline ecological function. An associated Shoreline Restoration and Protection Plan and Cumulative Impacts Analysis will follow development of the Final program and code elements. The cumulative impacts analysis will demonstrate how future development under the proposed SMP will result in no net loss of shoreline ecological function. The restoration measures described in the Shoreline Restoration and Protection Plan could be implemented to improve shoreline ecological functions beyond existing conditions.

1.2 Report Organization

The report is organized in the following sections:

- Regulatory Overview describes the SMA; local, state, and federal regulations, and cultural resource considerations.
- Shoreline Jurisdiction reviews the data and analysis used to determine the shoreline jurisdiction waterbodies and extents of the SMA shoreline jurisdiction.

- Richland Overview provides a description of the project area, including ownership and land cover characteristics, land use and SMP environment designations, geology, climate, surface water resources, water quality, floodplains and floodways, channel migration zones, and geologic hazard characteristics.
- Shoreline Inventory, Analysis, and Characterization describe the ecosystem processes and the level to which they are currently impaired or altered. The processes most critical to ecological functions are described for the Columbia and Yakima rivers. Also included are a review of the reach characterization methods and overview of inventory, analysis, and characterization tables.
- Public Access identifies existing public access goals and policies.
- Land Capacity Analysis identifies developable lands and associated residential unit and commercial area available for specific geographic areas within the City.
- Information sources and limitations are also described.

2 REGULATORY OVERVIEW

2.1 Shoreline Management Act

Counties, cities, and towns develop or update local SMPs to be in compliance with Washington State's SMA (RCW 90.58), and consistent with Ecology's guidelines. The State of Washington's SMA addresses concerns about the effects of unregulated development on shorelines. The SMP update process indicates the joint state/local nature of the SMA program as local governments develop SMPs in close coordination with Ecology, informed by local opportunities and constraints, and consistent with state law and guidelines.

2.2 Local, State, and Federal Plans and Regulations

SMPs provide provisions to protect archaeological resources, historic resources, and environmentally critical areas within the shoreline, as well as to maintain flood hazard protection (WAC 173-26-221). Environmentally sensitive areas (critical areas) within Richland include wetlands, frequently flooded areas, critical aquifer recharge areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.

In addition, federal, state, and City regulations also apply to these features. Federal regulations include the Clean Water Act, Sections 404 and 401, Endangered Species Act (ESA), Federal Water Pollution Control Act, National Environmental Policy Act (NEPA), and the National Floodplain Insurance Program. Federal regulations relevant to the Hanford Nuclear reservation in the northern part of the City and Urban Growth Area (UGA) include the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). Additionally, the US Army Corps of Engineers owns the Columbia River and lower Yakima River shorelines in Richland. The Corps leases these lands to the City for public park purposes. Maintenance and operation of existing public facilities and development of new facilities within Corps ownership is subject to the provisions of the lease agreement between the Corps and the City of Richland.

State regulations are administered through the RCW and include the State Environmental Policy Act (SEPA), the Hydraulic Project Approval (HPA), the Bald Eagle Protection Rules, the Surface Mining Act, the State Water Code and Water Pollution Control Act, and the SMA. State law and regulation relevant to the Hanford Nuclear reservation in the northern part of the City and UGA include the Model Toxics Control Act (MTCA) Statute (RCW Chapter 70.105D and Chapter 64.70) and MTCA Cleanup Regulation WAC Chapter 173-340.

The City has an existing SMP and critical areas regulations for wetlands, frequently flooded areas, geologically hazardous areas, aquifer recharge areas, and fish and wildlife habitat conservation areas. These areas are identified, as applicable to the City, in the map folio.

Table 1 includes a summary of these regulations.

Critical areas for each shoreline jurisdiction reach are also described within the flooding and geological hazards and habitat characteristics sections of the Reach Characterization Tables provided in Appendix A.

Table 1
Critical Areas Regulation Summary (as of 2013)

Jurisdiction	Date of Last Update	Wetland Rating System	Fish and Wildlife Areas	Protection Standards				
Richland Title No. Richland Municipal Code 22.10.010 - 22.10.380 General; Wetlands; Fish and Wildlife Habitat Areas; Geologically Haz. Areas.	2013	Wa. State Wetland Rating System for E.Wa. (Ecology Publication #91-58, or as revised proved by Ecology) Category I, II, III, and IV.	(As described in 22.10.170 - Definitions) 1. The areas listed under WAC 332-30-151; 2.The Lake Wallula wildlife habitat areas managed by the U.S. Army Corps of Engineers, including the Yakima River Wildlife Management Area and the Hanford Islands in the Columbia River managed by the U.S. Fish and Wildlife service; 3. Category I wetlands; 4. State nature area preserves or natural resource conservation areas.	Wetlands				
				Buffer (feet)	Category			
					I	II	III	IV
				High Intensity Land Use	150	100	50	50
				Low Intensity Land Use	75	50	25	25
				Mitigation Ratio	Category			
					I	II	III	IV
				Replacement Ratio	6:1	3:1	2:1	1.5:1
				Enhancement Ratio	12:1	6:1	4:1	3:1
				Fish and Wildlife Habitat Conservation Areas				
				Buffer (feet)	Wildlife Habitat Type			
					Critical		Secondary	
					High Impact Land Use	150	100	
Low Impact Land Use	75	50						
Geologically Hazardous Areas								
				Identification (as described in 22.10.240)	Geologic hazard areas identification and designation shall be consistent with the minimum guideline classifications established in WAC 365-190-080(4) which includes any future amendments to the code. Areas that are susceptible to one or more of the following types of hazards shall be classified as a geologic hazard area: 1. Erosion hazard; 2. Landslide hazard; 3. Seismic hazard; 4. Mine hazard.			
				Regulation (as described in 22.10.290)	The city of Richland may approve, conditionally approve or deny an activity, as appropriate, based on the degree to which significant risks are posed to public and private property and to the health and safety of the community. Conditional approval of the activity may include mitigation measures based on the geologic reports and studies. Where potential impacts of the activity cannot be effectively mitigated, or where the risk to public health, safety and welfare of the community is significant notwithstanding mitigation, the activity shall be denied. [Ord. 48-93; Ord. 45-00; Ord. 23-01].			

Notes:
WAC = Washington Administrative Code

2.3 Cultural Resources and Shoreline Development

State and local cultural resources laws apply to shoreline development. State laws include RCW 27.53 (Archaeological Sites and Records), which prohibits the unpermitted removal of archaeological materials and establishes a permitting process, and RCW 27.44 (Indian Graves and Records) which describes how human remains must be treated. Additionally, the City of Richland has a Memorandum of Understanding with the Umatilla Nation that calls for the City to coordinate with the Umatillas on shoreline projects that may have an impact on cultural resources.

Given the importance of shoreline locations throughout the human history of the area, the potential for cultural resources should be considered high for any shoreline development permit unless demonstrated otherwise. To comply with state and local law, applicants should be prepared to follow the provisions of RCW 27.53 and 27.44 if cultural resources are identified or encountered during the planning or construction process.

3 SHORELINE JURISDICTION ANALYSIS

The Washington state SMA defines the Shoreline of the State as “all ‘shorelines’ and ‘shorelines of statewide significance’ within the state” (RCW 90.58.030).

Shorelines are defined as:

“[A]ll of the water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except

- (i) shorelines of statewide significance;
- (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less and the wetlands associated with such upstream segments; and
- (iii) shorelines on lakes less than twenty acres in size and wetlands associated with such small lakes.” (RCW 90.58.030)

Shorelines of statewide significance for east of the crest of the Cascade Mountains (RCW 90.58.030) are defined in the statute as:

- (i) “Those lakes, whether natural, artificial, or a combination thereof, with a surface acreage of one thousand acres or more measured at the ordinary high water mark; and
- (ii) Streams or rivers (or segments of natural streams) “that have either: a mean annual flow of 200 cubic feet per second or more, or;
- (iii) The portion downstream from the first 300 square miles of drainage area.”

Shorelands (also known as shoreland areas) are defined by the statute as:

“[T]hose lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous flood plain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter; the same to be designated as to location by the department of ecology. Any county or city may determine that portion of a one hundred-year flood plain to be included in its master program as long as such portion

includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom.”

WAC Title 173, Chapter 18, Section 070 contains a listing of streams of statewide significance in Benton County, including the Columbia and Yakima rivers. Richland’s shoreline jurisdiction waterbodies are the Columbia and Yakima rivers. No lakes or other streams have been determined to meet the shoreline jurisdiction definitions provided above.

3.1 Shoreline Master Program Jurisdiction Determination Methodology

Anchor QEA received Geographic Information System (GIS)-formatted datasets for the Yakima and Columbia rivers from the Benton County GIS department, the City, the U.S. Geological Survey (USGS), the U.S. Department of Agriculture (USDA), and the U.S. Fish and Wildlife Service (USFWS). These datasets contained information from a variety of sources on the Yakima River and potential shorelands within the City. To create a dataset representing the mapped extent of the shoreline jurisdiction within the City, Anchor QEA utilized the following information:

- The [waterbodies] dataset was buffered by 200 feet (horizontally) on all sides utilizing the estimated ordinary high water mark (OHWM).
- The National Wetlands Inventory (NWI) layer was dissolved to create a new layer that included all wetland areas without boundaries between wetlands differing in classifications.
- All wetlands that intersected the [waterbodies] dataset were selected and exported into a temporary dataset of potential associated wetlands.
- The potential associated wetlands were reviewed and areas determined to be separated by a clearly distinct upland area, such as a road or levee, from shoreline waters were removed from dataset of potential associated wetlands.
- The NWI dataset was then reviewed and wetlands that did not intersect the [waterbodies] layer in the GIS but clearly appeared to be associated wetlands in the imagery were included in the dataset of potential associated wetlands.

3.2 Study Area

Based on the shoreline jurisdiction analyses, the Yakima River and the Columbia River, with associated wetlands and floodway, were identified for inclusion in SMP jurisdiction. Both rivers are shorelines of statewide significance. The extent of the shoreline jurisdiction is shown in Map 2 of the map folio.

3.3 Reach Breaks

The analysis and characterization information in this report is organized using a system of analysis reaches and subreaches to represent variations in land use and geomorphic characteristics along the shoreline. Physical changes often translate into differences in the function of the shoreline with regards to ecological and physical processes, which in turn may influence the shoreline designation.

The reach delineation was performed by evaluating aerial photography, topographic data, geologic maps, and land cover data, which were compiled in a GIS database. Specific factors that influenced the delineation of stream reaches include channel and floodplain geomorphology, geologic controls, channel confinement and modification, hydrology, and irrigation practices. Subreaches were used in the analysis and characterization primarily to distinguish different patterns in land use, ownership, zoning, and level of development. Subreaches were delineated primarily where changes in land use, parcel density, or zoning affected the current or potential future ecosystem function.

A list of the reaches and subreaches for the Yakima and Columbia River shoreline jurisdiction areas within the City are provided in Table 2.

Table 2
Yakima and Columbia River Reaches

Waterbody	City/ UGA	Reach Label	Reach Description
Yakima	City	1	The shoreline within this reach extends about 4,000 feet along the left bank of the Yakima River and is agricultural land owned by the City of Richland; it is currently in agricultural use.
Yakima	City	2	The shoreline within this reach extends about 3,000 feet along the left bank of the Yakima River on an outer oxbow with a very narrow band of riparian vegetation on a steep slope up from the river. At the top of the slope is the Bluffs subdivision, which is part of the Horn Rapids Golf Course development. SMA jurisdiction of 200 feet from the OHWM extends to just below the top edge of the slope.
Yakima	City	3	The shoreline within this reach extends about 4 miles along the left bank of the Yakima River from north of Glen Road to the I-182 bridge. Land use is largely agriculture or large lot rural lands in lots of 2 to 10 acres to the border of the W.E. Johnson Park at about the alignment of Swift Boulevard. The park and lands to the south are in public ownership. This area is largely floodplain that ranges up to 3/4 of a mile wide to Glen Briar Lane. Between this point and the bridge, there is a narrow riparian corridor bounded by a steep slope.
Yakima	City	4	The shoreline within this reach extends about 3 miles along the river south of the I-182 bridge over the Yakima River extending to the I-182 bridge over the Columbia River and is floodplain under U.S. Army Corps of Engineers jurisdiction and adjacent uplands managed by the City of Richland.
Yakima	City	5	The shoreline within this reach extends about 8,300 feet along the right bank of the Yakima River from the City Limits at Northlake Drive to the I-182 Yakima River bridge.
Yakima	City	6	The shoreline within this reach extends along the right bank of the Yakima River from the I-182 Yakima River bridge through the SR 240 bridge and to the eastern city limits, including Bateman and other smaller islands
Columbia	UGA	7	The shoreline within this reach extends about 8,000 feet along the right bank of the Columbia River from the north Urban Growth Area boundary to the City limits at Horn Rapids Road. The reach includes largely U.S. Department of

Waterbody	City/ UGA	Reach Label	Reach Description
			Energy land and includes portions of Wooded Island, Susan Island, and Barb Island in the Columbia River.
Columbia	City	8	The shoreline within this reach extends about 8,000 feet along the right bank of the Columbia River from the current City limits at Horn Rapids Road to Spring Road. The reach includes shoreline areas managed as part of the McNary Dam project and private and public uplands.
Columbia	City	9	The shoreline within this reach extends along the right bank of the Columbia River from Spring Road to Howard Amon Park.
Columbia	City	10	The shoreline within this reach extends about 2 miles along the right bank of the Columbia River from the north end of Howard Amon Park to the I-182 bridge. The reach includes shoreline areas managed by the City as park and open space, as well as residential and commercial uses, including a marina.

Figures depicting these reaches and subreaches, where applicable, are provided in the map folio; characterization tables are provided in Appendix A.

4 RICHLAND OVERVIEW

4.1 Ownership and Land Cover

Ownership throughout the City is dominated by private lands; however shoreline areas are predominantly under public ownership. Public lands are dominated by City-owned parcels. Public space within the shoreline jurisdiction of the Yakima River includes W.E. Johnson Park, the Chamna Natural Preserve, the Riverview Preserve managed by the U.S. Army Corps of Engineers and Bateman Island at the river delta. On the Columbia River, public space includes Leslie Groves Park, Howard Amon Park, Columbia Point Marina Park, South Columbia Point Park, and Columbia Park West at the confluence of the Columbia and Yakima rivers. Table 3 documents the percentage of ownership types within the City limits and UGA.

Table 3
Ownership Types within City Limits and UGA

Ownership Type	Percentages
City	19.12%
County	0.61%
Private	78.25%
State	1.90%
Federal*	0.12%

*Federal land under lease to the City is classified as City land

Land cover in Richland is dominated by developed areas and shrub/scrub habitat. Table 4 documents the percentage of land cover types within the City limits and UGA.

Table 4
Land Cover Types within City Limits and UGA

Land Cover Type	Percentages
Agriculture	17.62%
Developed	42.23%
Forested	0.06%
Grassland	0.23%
Open Water	7.80%
Shrub/Scrub	30.80%
Wetlands	1.26%

4.2 Land Use

4.2.1 Citywide Existing Land Use

Land use is characterized by reach in the tables and text below.

4.2.2 Current Citywide Land Use

The City is part of the Tri-Cities Metropolitan Area in southeast Washington state and includes 25,197 acres in the current incorporated limits and additional 5,433 acres in the UGA. The 5.8 square miles in the City and the associated UGA comprise about 5 percent of the 111 square miles designated UGA in the Benton County Comprehensive Plan.

Residential use comprises about 23 percent of the land area, industrial and business park about 20 percent, commercial/retail about 5 percent, natural open space about 8 percent, and developed open space about 7.4 percent.

Much of the Columbia River shoreline and portions of the Yakima River shoreline are managed by the U.S. Army Corps of Engineers as part of the McNary Dam project with large portions of the federal ownership leased to the City as park and open space.

The major area of private commercial development on the Columbia River shoreline is located in the Columbia Point Area between Howard Amon Park and the Interstate 182 bridge, and includes two hotels and a commercial/restaurant complex as well as a marina. The majority of this area is multi-family development.

The natural open space system includes most of the Yakima River and Columbia River shorelines, islands, greenways, and designated areas within residential developments.

Major elements on the Yakima River include the Tapteal Greenway which runs approximately 30 river miles, from Benton City to Columbia Point; City owned W.E. Johnson Park includes about 236.0 acres located south of Van Giesen Street including mostly natural open space with about 1/2 mile of Yakima River frontage; the Corps owned Chamna Natural Preserve is a 276+ acre park located on the left bank of the river between the Interstate 182 bridge and State

Route (SR) 240; the Riverview Preserve is a 268.0-acre area owned and managed by the Corps on the right bank of the Yakima River; Bateman Island is 160 acres in the Yakima River Delta under Corps ownership and leased to the City.

On the Columbia River, major components of the City managed open space system include: Leslie Groves Park located between Snyder Street and Van Giesen Street which is 149.2 acres in size; Howard Amon Park which extends from about Gowen Drive to the Hampton Inn on Bradley Blvd.; Columbia Point Marina Park which is 14.1 acres in size and located in the southerly portion of Columbia Point Drive; Columbia Point South Park, which is a largely undeveloped area of 230 acres located at the confluence of the Yakima River and the Columbia River. Columbia Park West is 65 acres and located south of the Yakima River delta.

Existing land use information provides a baseline understanding of land use intensity, character, land cover, and the location of structures and other uses found within the shoreline jurisdiction. Tables 5 and 6 provide a summary of land use characteristics and the geographic character of existing development per reach. Table 6 includes descriptions of the size and dimensions of parcels that abut the shoreline, the extent to which existing structures are located in proximity to the water, and the extent (width) and quality of existing riparian, wetland, and shrub steppe vegetation. The wider vegetation depths indicated in Table 6 primarily exist in the Yakima River delta and Yakima River floodplains.

This data covers a range of parcels and often covers a range of conditions within a given reach. For the most part, land uses on the Yakima River are in recreation or open space use with large parcels, few structures, and generally high quality riparian vegetation. The Columbia River reaches are characterized primarily by open space and parks and with urban development in Reach 10, the Columbia Point area.

A.

Table 5
Shoreline and Land Uses Summary Characteristics by Reach

Waterbody	City/ UGA	Reach Label	Single Family	Multi- Family	Land Use						Transportation	Vacant or Other
					Commercial		Industrial		Recreation			
					Water- Oriented	Non- Water- Oriented	Water- Oriented	Non- Water- Oriented	Water- Oriented	Non- Water- Oriented		
Yakima	UGA	1	0	0	0	0	0	0	0	0	0	48 ac
Yakima	UGA	2	0	0	0	0	0	0	0	0	0	14 ac
Yakima	UGA	3	5 ac	0	0	0	0	0	0	0	0	850 ac
Yakima	City	4	0	0	0	0	0	<1 ac	0	<1 ac	0	1,736 ac
Yakima	City	5	0	0	0	0	0	0	0	0	<1ac	192 ac
Yakima	City	6	0	0	0	4 ac	0	2 ac	6 ac	30 ac	30 ac	321 ac
Columbia	UGA	7	0	0	0	0	0	0	0	0	<1 ac	79 ac
Columbia	City	8	4 ac	0	0	0	0	0	1 ac	<1 ac	0	70 ac
Columbia	City	9	5 ac	0	0	0	0	0	2 ac	40 ac	2 ac	41 ac
Columbia	City	10	0	8 ac	0	5 ac	0	0	14 ac	29 ac	<1 ac	2 ac

Notes:

ac = acres

Table 6
Parcels Summary Characteristics by Reach

			Average Conditions by Parcel					Total by Reach	
Waterbody	City/ UGA	Reach Label	Parcel Size (acre)	Parcel Width (feet)	Parcel Depth (feet)	Existing Structures Setback (feet)	Vegetation Depth (feet)	Overwater Structures	Impervious %
Yakima	City								
Yakima	UGA	1		4,000	500	100	100	0	>10%
Yakima	UGA	2		3,000	200	100	100	0	>10%
Yakima	UGA	3		300-5,000	600-3,000	100-1,000	10-1,000	0	>10%
Yakima	City	4		450-25,300	1,600	30-4,300	0-4,300	3	>10%
Yakima	City	5		8,300	50-650	50-650	50-650	1	>10%
Yakima	City	6		100-21,000	350-2,300	20-4,500	20-4,500	12	10%
Columbia	UGA	7		8,000	2,600-4,100	60-800	30-100	0	>10%
Columbia	City	8		100-11,000	60-600	0-600	0-130	12	>10%
Columbia	City	9		100-14,520	300-700	0-500	0-500	1	>10%
Columbia	City	10		100-7,500	350-600	0-100	0-100	7	50%

4.2.3 Water-dependent Uses

Water-dependent uses in the City include largely recreation marinas (Columbia Park West and Columbia Point) and boat launches on both the Columbia and Yakima rivers. Two port facilities are located in North Richland near Horn Rapids Road and consist of barge offloading piers and ramps.

4.2.4 Water-related Uses

Water-related uses, including water enjoyment uses, include much of the park and open space areas along the shorelines that provide for recreational use, including water-related beach and swimming access as well as aesthetic enjoyment of the shoreline on trail systems and passive recreation areas. Some mixed use development on Columbia Point provides opportunities for public access and the public access component is generally on public land adjacent to the trail corridor.

4.2.5 Non-water-related uses

Non-water-related uses directly adjacent to the water are largely limited to a small area of large lot single family/rural use along the Yakima River in the vicinity of Van Giesen Street; a single family residential area along the Columbia River between Ferry Road and Sprout Street and the Washington State University (WSU) Tri-Cities campus north of Sprout Road.

4.2.6 Future Land Use

4.2.6.1 Vacant Lands

The largest area of shoreline vacant lands in Richland is the Port of Benton Technology and Business Campus located in North Richland adjacent to the Columbia River with more than 6,000 feet of river frontage.

4.2.6.2 Water-oriented Uses

The potential for water-dependent use is largely limited to recreation and moorage. The expansion of port uses related to barge traffic on the Columbia River is limited by regional demand and the apparent surplus of potential port sites in Benton and Franklin Counties

(POK 2010). In addition, the City is at the end of the navigable portion of the Columbia River and does not have railroad access adjacent to the river.

There may be some potential for water-related and water enjoyment use in the Columbia Point area, however vacant or re-developable private land is limited in that area.

4.2.6.3 *Non-water-Oriented Uses*

The potential for non-water oriented use is greatest in the North Richland Technology & Business Campus. There are relatively few private undeveloped or re-developable parcels in the Columbia Point area. The most likely potential site in this area is the existing Shilo Rivershore Hotel. Additional single family and multi-family development is designated for portions of North Richland north of Battelle Blvd.

4.3 *Current SMP Environment Designation*

The City applies its shoreline environment designations within its shoreline jurisdiction under its current SMP. The 1979 Shoreline Master Program indicates four Environment Designations: Natural, Conservancy, Rural, and Residential. The SMP also includes policies for each Environment Designation. The existing Environment Designations are shown in the Reach Characterization Tables in Appendix A.

4.3.1 *Natural*

Natural shorelines contain unique and valuable natural or cultural features, including several islands. These areas should be preserved and protected from intolerant forms of development and use. All shorelines are presently in use, primarily for city parks/natural open space and residences, as well as some industrial and commercial uses. Some Natural Environment occurs in all of the shoreline areas.

4.3.2 *Conservancy*

The Conservancy Environment is used for those areas that contain a unique character (natural, cultural, aesthetic, historic, recreation) that should be maintained, but limited

development or use can be tolerated. These areas are important for present and future recreation uses that can maintain the natural character of the shoreline as practicable.

4.3.3 Rural

The Rural Environment is intended for those areas characterized by intensive agricultural and outdoor recreational uses and those areas having a high capability to support active agricultural practices and intensive outdoor recreational development. Designation of Rural Environment areas protects prime farming lands and rural areas from urban expansion and also provides opportunities for recreation and other compatible uses.

4.3.4 Urban

The Urban Environment is an area with few limitations for high intensity land use including residential, commercial, recreational, and industrial development. It is particularly suitable to those areas presently subjected to extremely intensive use pressure, as well as areas planned to accommodate urban expansion. The purpose of the Urban Environment designation is to ensure that optimum utilization of shorelines is occurring within urbanized areas for a multiplicity of urban uses.

4.4 Geology

The geology, soils, and topography of the Richland area are primarily dictated by glacial outburst flooding that occurred near the end of the last major glacial period, approximately 18,000 to 20,000 years before present. This event is referred to as the Missoula Floods. The geologic makeup is the result of erosion of pre-Floods geologic units, deposition of sediments carried by the floodwaters, and the formation of the unique topographic features that influence present-day hydrology. Prior to the Floods, the geology of the County consisted primarily of Miocene-aged Columbia River Basalt (CRB) flows that were in some places (e.g., plateaus) capped with varying thicknesses of wind-blown fine sands and silt known as loess (Grolier and Bingham 1978). The segments of the Yakima and Columbia rivers around Richland are located in a wide valley that is comprised primarily of alluvial soils with relatively high infiltration rates. Within upland areas, particularly areas farther from the confluence of the river, outburst flood deposits of gravel occur as well.

4.5 Climate

The City falls within the Central Basin region of Washington, which has the lowest precipitation rates within Washington state. Annual precipitation in the Richland area averages around 7.15 inches and precipitation is commonly associated with summer thunderstorms and winter rains and snowfall. Snowfall depths rarely exceed 2 to 3 inches and occur from November to March. High temperatures in January can range from 35 to 45 degrees Fahrenheit (1.6 to 7.2 degrees Celsius [°C]) with low temperatures between 20 to 30 degrees (-6.7 to -1.1 °C). Summer high temperatures are usually in the high 80s to low 90s with low temperatures in the high 50s (WRCC 2012).

4.6 Water Resources

4.6.1 Surface Water Resources

This section presents surface water resources as they relate to shoreline master planning for the planning area. The planning area is located in the lower Yakima River basin (Water Resource Inventory Area 37). Major surface water resources are the Yakima River and Columbia River.

4.6.1.1 Yakima River

The Yakima River is a major surface water resource for the planning area. The nearest current instantaneous USGS gage on the Yakima River is gage #12510500 (Yakima River at Kiona, Washington). The Yakima River at this gage has an average annual flow of 3,497 cubic feet per second (cfs) for its 78-year period of record (1934 to present; USGS 2012). The Yakima River drains a basin area of 5,615 square miles at this gage. This gage is also a U.S. Bureau of Reclamation (USBR) gage (gage KIOW).

Yakima River hydrology in the planning area is affected by the Yakima Project. The Yakima Project includes a reservoir system that stores natural flow in the upper Yakima River and Naches River basins for release during high demand periods. The storage and release cycle causes the Yakima River in the planning area to be regulated with flows higher than natural in the late summer and fall and lower than natural in the spring and early summer.

Additionally, Yakima River flow in the planning area is affected by return flow from water use in the upper Yakima River and Naches River basins.

The Yakima Project reservoir system also captures floods in the upper Yakima River basin. This operation reduces the frequency, duration, and magnitude of floodplain inundation and decreases the regulatory floodplain and floodway size compared to natural conditions (USBR 2002). The City planning area has portions along the Yakima River with good floodplain connection causing the floodplain area to be significantly greater than the floodway area.

Water resources in the Yakima River and Yakima River basin are the subject of the Integrated Water Resource Management Plan (Integrated Plan). The Integrated Plan is a proposed approach to improve water management in the Yakima River basin. According to the Integrated Plan, the goals are “to protect, mitigate, and enhance fish and wildlife habitat; provide increased operational flexibility to manage instream flows to meet ecological objectives; and improve the reliability of the water supply for irrigation, municipal supply, and domestic uses” (USBR and Ecology 2011). The proposed Integrated Plan is expected to provide pulse flows in the spring to the Yakima River during dry months within the planning area.

4.6.1.2 Columbia River (Lake Wallula)

The Columbia River is the second major surface water resource for the planning area. The portion of the Columbia River within the planning area is part of the upstream portion of Lake Wallula. Lake Wallula is created from the impoundment of the Columbia River by McNary Dam. The active continuous USGS gage nearest to the planning area is gage #12514500 (Columbia River on Clover Island at Kennewick, Washington). The Columbia River at this gage drains 104,000 square miles. This gage is a water surface elevation gage and has records from Water Year 1988 to present. The water surface elevation at this gage ranges from 335 feet to 344 feet (NGVD 1929).

Because the planning area is within the Lake Wallula portion of the Columbia River, water levels are generally stable. Columbia River floodplain levels are also confined due to river regulation.

4.6.2 Surface Water Quality

This section presents surface water quality as it relates to shoreline master planning for the planning area.

4.6.2.1 Yakima River

The Yakima River is listed on the current 303(d)¹ list of impaired waters for several parameters including pH, dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyltrichloroethane (DDT) within the planning area.

Ecology has a long-term water quality monitoring gage located near the planning area (gage #37A090, Yakima River at Kiona, Washington). Its period of record is 1947 to 1948, 1953 to 1962, and 1967 to present. At this gage, water quality standards criteria that are typically exceeded are pH during the irrigation season and temperature during the late summer (July and August).

One of the water quality parameters (temperature) was studied in detail within the planning area during summer months of 2008 and 2009. It was noted in this study that temperatures were above the lower Yakima River water quality standard of 21 °C. There were however localized areas of cooler temperatures caused by non-point source seeps likely caused by groundwater discharge. The localized areas did not appear to be located within the planning area (Benton Conservation District 2011).

In the planning area, Yakima River water quality is affected by irrigation return flows. Irrigation return flows and operational spills from drains and tributaries contribute up to 80 percent of the flow in the lower Yakima River. These return flows can affect many water quality parameters, including increases in suspended sediment, turbidity, fecal coliform, pesticides, temperature, and nutrients. The return flows can also cause a reduction in

¹ The term "303(d) list" is short for the list of impaired and threatened waters (stream/river segments, lakes) that the Clean Water Act requires all states to submit for EPA approval every two years on even-numbered years. Accessed April 29, 2013 from: <http://water.epa.gov/lawsregs/lawguidance/cwa/tmdl/overview.cfm>

dissolved oxygen and an increase in pH (USBR 2002). Some return flows may cause localized areas of lower temperatures (Benton Conservation District 2011).

4.6.2.2 *Columbia River (Lake Wallula)*

The Columbia River is on the 303(d) list of impaired waters for temperature within the planning area. Additionally, the Columbia River has a total maximum daily load (TMDL) for total dissolved gas and is a 305(b) water of concern for pH.

Total dissolved gas is measured in the Columbia River at several gages as part of the Columbia River Data Access in Real Time (DART) program. The DART gage nearest to the planning area is gage PAQW (Columbia River at Pasco, Washington). This gage has been in operation since 2000.

4.6.3 ***Groundwater Resources***

Groundwater in the planning area is within the Columbia Plateau aquifer system, which consists of the Columbia River Basalt Group overlain by quaternary flood deposits. Groundwater in the planning area is hydraulically connected to surface water, so the amount of groundwater pumping affects surface water stream flow, and groundwater resources are recharged by surface water interaction. The estimated mean annual groundwater recharge in the planning area is up 2 inches (USGS 2011).

Groundwater interaction with surface water also causes seepage losses or gains within rivers. The Yakima River within the planning area has an estimated loss. This can have an effect on surface water quantity and quality.

4.6.4 ***Floodplain and Floodway***

Damage from flooding along the Columbia River occurred in 1948 prior to the construction of the dam system. Flooding from the Yakima River has affected the City more recently. Flood stage for the Yakima River is at 13.0 feet and is measured at the Kiona gage near the SR 223 bridge in Benton City. Benton County has determined that moderate flooding occurs when flows at this gage measure above 14.5 feet and major flooding occurs above 16.0 feet (Benton County Emergency Services 2012). Flood stage for the Columbia River is 32.0 feet and is measured at the gauge below the Priest Rapids dam. During maintenance of the

Priest Rapids Dam spillway in July of 2012, high outflows from the dam raised the river near flood stage in the Tri-Cities (KNDU 2012). The floodway boundary is shown in the map folio on Map 7.

4.6.5 Channel Migration Zone

In the vicinity of the City, the Yakima River is a meandering single- thread channel that widens and becomes braided as it approaches the Columbia River. Historical photos indicate some lateral movement and potential bank flooding. Much of this area is mapped in the Federal Emergency Management Agency (FEMA) High Risk Flood Area supports wetlands, especially at the confluence of the Columbia River. The channel migration zone is depicted on applicable figures in map folio, and also discussed in the Yakima River tables in Appendix A.

The Columbia River is a stable, confined, single-thread channel with low sinuosity and depositional (un-vegetated) mid channel islands and bars. The flooding risk is low in the Columbia River due to the levy and dam system maintained by the Corps of Engineers.

4.7 Geologic Hazards

Geologically hazardous areas are defined as those lands susceptible to erosion, landslides, seismic or mine hazard events. Identified hazardous areas are shown on Map 7 in the map folio. The boundary of this area is based on a 200-foot buffer from either the OHWM of the Yakima River or from the floodway boundary as determined by FEMA flood insurance maps.

4.8 Cultural Resources

4.8.1 Historical Background

The City is located at the confluence of the Yakima and Columbia rivers. It is in the Southern Plateau, part of the larger Columbia Plateau culture area. The Southern Plateau stretches from southern Okanogan County in the north to the northern border of the Great Basin to the south. The prehistory and history of the Southern Plateau is briefly summarized here. Known archaeological and historic sites are discussed, as well as potential for archaeological and historic sites.

At the end of the Pleistocene era, hunters of large mammals fanned out across North America. This period is known in the Columbia Plateau as Paleoindian (Ames and Maschner 1999:64-66), and in the southern Plateau as Period Ia (Ames et al. 1998). In the Columbia Plateau as a whole, Chatters and Pokotylo (1998) included these early mobile foragers in the Early Period from about 11,000 to 8,000 years ago. The earliest Paleoindian sites recorded in the Columbia Plateau are attributed to the Clovis culture, including the Ritchey-Roberts Clovis cache in East Wenatchee, which dates to 12,250 BP (Mehring and Foit 1990).

After the brief but widespread Clovis occupation, a “broad-spectrum” hunter-gatherer culture developed in the Columbia Plateau region and persisted until the middle Holocene, around 5,300 years ago. This culture spans the latter part of the Early Period and the Early Middle Period in the Columbia Plateau sequence (Chatters and Pokotylo 1998), and Period Ib in the Southern Plateau sequence (Ames et al. 1998).

A shift towards more permanent settlement began around 6,000 years ago. Known as the Late Middle Period in the Columbia Plateau, and Period II in the Southern Plateau, this period lasted until the beginning of the early Holocene around 3,000 years ago (Chatters and Pokotylo 1998; Ames et al. 1998). In general, Period II tool assemblages are characterized by the addition of groundstone and bone/antler tools to the existing flaked stone technology.

Late Holocene cultures in the Columbia Plateau region exhibit “a “shift in adaptations...to storage-dependent collector strategies” (Chatters and Pokotylo 1998:76), which are characterized by intensive salmon fishing and associated storage features, social inequality, large permanent winter villages, and diverse tool assemblages. Labeled the Late Period, this shift begins around 4,000 years ago and persists until historic contact (Chatters and Pokotylo 1998). In the southern Columbia Plateau, the contemporaneous Period III also includes evidence of intensive camas processing and fiber and wood artifacts preserved in the relatively dry climate (Ames et al. 1998). The late Holocene archaeological cultures correlate with historic ethnographic descriptions.

The Yakima-Columbia confluence has a rich archaeological record, with sites in the area attributed to all of the Southern Plateau cultural phases. The area has been “occupied more or less continuously for the last 10,000 years” (Western Heritage 1983:4). There are 32

recorded archaeological sites within a mile of the confluence. National Register-listed properties include the Columbia Point site, the Bateman Island Site, and the Tri-Cities Archaeological District.

The City is in the traditional territory of the Yakama Nation, a Sahaptin-speaking Plateau people (Walker 1998). Wanapum and Walla Walla people also used the area (Kershner 2008). Traditional Plateau cultures were based on a seasonal round that took advantage of fish runs, game, and root resources, as well as trade, kinship ties, and intermarriage among groups (Walker 1998). Prior to historic resettlement, permanent winter villages anchored the seasonal round (Boyd and Hajda 1987). Villages consisted of large mat lodges, each housing an extended family, and occasionally also smaller conical structures (Stern 1998; Schuster 1998). Villages were the basic political unit (Schuster 1998).

Fishing activities revolved around an early salmon run in March, and a second, larger run in June (Schuster 1998). Fishing technology included the portable (toggling harpoons, leisters, hook-and-line, and nets) and the non-portable (traps, weirs, and platforms at permanent fishing stations; Schuster 1998). Gathering activities took place throughout the year. Fish, roots, and berries were processed, dried, and stored. Although salmon were a key staple, plant foods also made up a significant portion of the diet (Hunn 1981). Religious life involved adherence to both the Guardian-Spirit complex, which included the sweatlodge and curative “sings”; and the Washat religion, which was based on ceremonies held in the longhouse and included first food feasts in the spring celebrating the return of the salmon and newly sprouting plants (Schuster 1998).

By the time of the first sustained contact between the tribes of the Richland area and Euro-American settlers in the mid 1800s, tribal life had already been significantly impacted. Introduced diseases decimated the population (Vibert 1997:50) while the introduction of the horse altered social and economic activities.

The earliest recorded Euro-American exploration of the Columbia River was in 1792 (Hayes 1999), but settlement of the region was slow until the 1840s when Americans were attempting to wrest control from the British (Mackie 1997). The Oregon Treaty of 1846 awarded the Oregon Territory to the United States (Wells 2000). In 1853, Washington

became a territory separate from Oregon, and by the next year, governors of both territories began pursuing treaties that relegated tribes to reservations (Wilma 2003). Fourteen tribes and bands signed the Treaty of 1855 that established the Yakama Indian Reservation (YNM 2011).

The Lewis and Clark expedition recorded the first description of the confluence of the Columbia and Yakima Rivers in 1805, and David Thompson passed through in 1811 (Nisbet 2005:109). The area was rarely visited, and several early attempts at settlement (e.g., a mission, a group of cattle ranchers) failed (Kershner 2008). However, by the 1890s, settlers had established an agricultural economy and built irrigation systems (Kershner 2008).

Richland remained a small, primarily agricultural community until 1943, when the plutonium production site was established just to the north at Hanford (Sanger 1995:4). The shift in the community was profound, and “the old Richland became, virtually, extinct [while]...the new Richland was being built at an astonishing pace” (Kershner 2008:1). Everything in the city was owned by the U.S. government until 1960. The Hanford plant was deactivated piecemeal in the 1990s, though many Richland residents are still employed in maintenance and cleanup at the site (Gerber 1992:223). The modern economy is focused on technology, medicine, and education (Kershner 2008).

4.8.2 Recorded Cultural and Historical Resources

The Department of Archaeology and Historic Preservation (DAHP) maintains an electronic database of archaeological sites, historic structures, and cemeteries. Resources, except for cemeteries, are listed by reach in Table 7.

Table 7
Recorded Cultural and Historical Resources within 1,000 Feet of the Shoreline in the Richland Area, by Reach

Reach	Archaeological Site or Isolate	National Register-Listed Property	Structures Older than 50 Years, Significance Not Evaluated
1	None recorded (just downstream of the Horn Rapids Traditional Cultural Property)	None recorded	None recorded
2	None recorded	None recorded	1 structure
3a	2 precontact sites	None recorded	10 structures
3b	None recorded	None recorded	1 structure
3c	2 precontact sites	None recorded	2 structures
4a	1 precontact site 1 multi-component site	None recorded	None recorded
4b	1 precontact site	Precontact site is Register-listed	None recorded
4c	1 precontact sites 1 historic era site	Precontact site is Register-listed Tri-Cities Archaeological District	None recorded
5	1 historic era site	None recorded	1 structure
6a	1 precontact site	None recorded	7 structures
6b	1 historic era site	None recorded	1 structure
6c	11 precontact sites 5 historic era sites 1 multi-component site	1 precontact site is NRHP-listed Tri-Cities Archaeological District	> 30 structures
7a	6 precontact sites 2 historic era sites 1 multi-component site	Hanford South Archaeological District	1 structure
7b	4 precontact sites 2 historic era sites	Hanford South Archaeological District	3 structures
7c	7 precontact sites 4 historic era sites	Hanford South Archaeological District	None recorded
7d	2 precontact sites	Hanford South Archaeological District	None recorded
7e	None recorded	Hanford South Archaeological District	None recorded
7f	1 precontact sites	Hanford South Archaeological District	None recorded
8a	2 historic era sites	Hanford South Archaeological District	None recorded
8b	1 precontact site	Hanford South Archaeological District	None recorded
8c	1 precontact site 1 historic era site	Hanford South Archaeological District	None recorded
8d	1 precontact sites	Hanford South Archaeological District	None recorded

Reach	Archaeological Site or Isolate	National Register-Listed Property	Structures Older than 50 Years, Significance Not Evaluated
8e	1 precontact sites	Hanford South Archaeological District	> 30 structures
8f	5 precontact sites	Hanford South Archaeological District	None recorded
9a	1 precontact site	Hanford South Archaeological District	> 30 structures
9b	None recorded	Hanford South Archaeological District	> 30 structures
9c	1 precontact site	Hanford South Archaeological District Tri-Cities Archaeological District Gold Coast Historic District	> 30 structures
9d	1 precontact site	Tri-Cities Archaeological District	> 30 structures
9e	2 precontact sites	Hanford South Archaeological District	None recorded
9f	1 precontact site	Hanford South Archaeological District	None recorded
10b	1 precontact site	Tri-Cities Archaeological District	None recorded
10c	2 precontact sites	1 precontact site is Register-listed Tri-Cities Archaeological District	None recorded

4.8.3 Potential for Archaeological and Historic Resources

The Richland area has a dense concentration of archaeological and historic resources, many with exceptional significance and cultural value. A number of archaeological and historical site types could be expected, including:

- Lithic scatters, quarries, and caches
- Precontact habitation sites (camps, villages, cave sites)
- Burial sites and cemeteries
- Resource procurement sites (fish traps, camas ovens)
- Pictographs and petroglyphs
- Historic habitation sites (homesteads, farms, cabins)
- Historic agricultural infrastructure
- Historic and precontact transportation corridors (trails, routes, railroad grades, road grades)
- Historic public works infrastructure (dams, transmission corridors)

Some sites may be on or near the surface, and others may be deeply buried, depending on the localized geomorphology.

4.8.4 Cultural Resources and Shoreline Development

State and local cultural resources laws apply to shoreline development. State laws include RCW 27.53 (Archaeological Sites and Records), which prohibits the unpermitted removal of archaeological materials and establishes a permitting process, and RCW 27.44 (Indian Graves and Records) which describes how human remains must be treated.

Given the importance of shoreline locations throughout the human history of the area, the potential for cultural resources should be considered high for any shoreline development permit unless demonstrated otherwise. Shoreline areas near the confluence should be considered especially sensitive. To comply with state and local law, applicants should be prepared to follow the provisions of RCW 27.53 and 27.44 if cultural resources are identified or encountered during the planning or construction process.

5 SHORELINE INVENTORY, ANALYSIS, AND CHARACTERIZATION

5.1 Ecosystem-wide Processes and Conditions in Richland

An ecosystem is a natural system consisting of biological (plants, animals, and microorganisms), physical, and chemical factors that together make up the environment. Ecosystem-wide processes are the naturally occurring physical and chemical cycles that shape the landscape and determine habitat types and associated ecological functions (WAC 173-26-020 (14)). Processes occur at multiple scales and are influenced by hydrology, geology, topography, soils, land cover, and land use characteristics. These processes determine the types and quality of shoreline functions or services that contribute to the maintenance of aquatic and terrestrial environments that make up an ecosystem (WAC 173-26-020 (13)).

The following sections discuss ecosystem processes and habitat structures that these processes form and maintain. This section also describes conditions, including alterations to the ecosystem process, for the Yakima and Columbia Rivers and shoreline along the City and the UGA. Alterations to ecosystem processes can affect habitat structure and the availability of habitat services, especially over long periods of time. Ecosystem processes and conditions in Richland are presented through the categories of hydrology, sediment, water quality, and habitat.

5.1.1 Hydrology

5.1.1.1 Ecosystem Process

The process of water delivery, movement, and storage within an ecosystem is largely affected by landform, geology, soil characteristics, and climate including precipitation. Rain and snowmelt provide the hydrologic inputs into a watershed. This cycle affects other physical, chemical, and biological functions of the river system. The speed with which water flows through the watershed also affects whether nutrients, sediments, or other materials are deposited or retained in the water and transported through the watershed.

Water is delivered to streams primarily from surface water runoff from above and, in some cases, from groundwater. The horizontal structure of river and stream channels includes the wetted channel zone where water is present during low-flow events, an active channel that

is seasonally inundated, and the riparian zone located above seasonal high water elevations. The vertical structure of these systems includes a benthic zone along the surface of the bottom substrate and the hyporheic zone, which provides a transition between the surface and the groundwater, or phreatic zone. Hyporheic and benthic zones cycle out excessive nutrients and contaminants, store and transport both water and sediment, maintain base flows, and can support vegetation and microorganism communities. The interaction of hydrologic and geomorphic processes contributes to habitat structures useful to aquatic species including shallow water and off-channel refugia, gravel bars, pools, riffles, and the transport of organic material, including large woody debris.

5.1.1.2 *Conditions in Richland*

The City has two major surface water resources: the Yakima and Columbia Rivers. See Table 1 in Section 3.3 for a description of the reaches identified for these water bodies. There are a number of small inlets along the Yakima River, including a shallow groundwater return within Reach 2, and the City's wastewater treatment plant discharge within Reach 4. Along the Columbia River there is a surface water outlet within Reach 9 and the Yakima River inlet at Reach 10. The hydrologic process occurring within the City on the Yakima River and associated drainage area is affected by Yakima Project operations. Along the Columbia River, McNary Dam operations affect the hydrologic processes. Major alterations from this system include the artificial storage and release cycle that produces higher than natural flows in the late summer and fall and lower than natural flows in the spring and early summer. Riparian vegetation and aquatic species adapt to seasonal inundation fluxes and these changes in the natural flows may adversely affect these systems and species. Flood storage occurring in the upper Yakima River and Columbia Basins outside of the City reduces the frequency, duration, and magnitude of floodplain inundation, while decreasing the floodplain size. This change in the hydraulic regime also affects the cycling of sediment, nutrients, and organic materials within the river, as discussed below.

5.1.2 *Sediment*

5.1.2.1 *Ecosystem Process*

Sediment delivery through a watershed is based on interactions between, gravity, wind, and water across the various geologic features, soils, and land covers. Soil erosion, landslides, and

mass wasting provide the majority of sediment inputs within the Yakima River. Landslides and mass wasting are a function of slope, soil, and water interacting to create instability. Soil erosion is a function of slope, soil cohesiveness, and cover interacting with water or wind forces. Sediments transported by water or wind are deposited wherever and whenever the water or wind transporting them slows. This is often within topographic depressions where sediment is deposited into lakes and stream pools, wetlands, and floodplains. The sediment erosion, transport, and deposition cycle is a major aspect of river and stream channel formation and channel migration.

The maintenance of shallow water habitat along the Yakima and Columbia Rivers is driven by the recruitment and transport of appropriately-sized sediments. Shallow water areas with small, clean natural substrates (e.g., sand and pebbles) are important for benthic production and as refuge for juvenile fish. Coarser substrates tend to provide habitat for predatory fish. Fine sediment (silt and clay) can decrease water quality by creating turbidity that adversely affects some aquatic species.

Shoreline armoring typically exists in developed areas or in areas where significant infrastructure exists, such as overwater bridge crossings or boat ramps. These armoring structures tend to disconnect natural sediment sources from erosion by forming a physical barrier between the shore and the water itself. The wave energy reflected off of these types of armoring leads to the washing away of smaller substrate sizes that support small benthic animals and also prevents riparian vegetation establishment with associated habitat functions.

5.1.2.2 Conditions in Richland

Channelization of streams can include hardening of banks with levees or revetments, straightening of channels, deepening of channels, removal of roughness that impedes flow, and other efforts to minimize the migration of the channel while maximizing flow capacity. Confinement, channelization, and channel incision of the Yakima River has occurred in certain reaches upstream of Richland. Downstream effects of these alterations include greater deposition of transported sediments, increased flood stage, and loss of channel capacity. Localized impacts of hardened banks in Richland include higher water velocities,

increased sediment transport, potential head cutting, and bank instability potentials near the areas of hardening.

Natural channel migration and sediment deposition occurs in reaches of the river that are not confined through shoreline development or that contain hardened banks. Shoreline hardening along the Yakima River includes bridge abutments within reaches 3 and 4 and armoring to protect park and trail infrastructure in Reach 6. Along the Columbia River, hardening includes a bulkhead and riprap armoring around the water intake facility and barge slip within Reach 8 as well as docks within this reach, a water intake structure, docks and boat ramps within Reach 9, and marina docks, boat ramps, a riprap breakwater structure and significant riprap armoring within Reach 10. Near these abutments and hardened shorelines, channel migration and beneficial sediment inputs are limited, though areas adjacent to this hardening may have increased erosion because of localized higher water velocities and wave reflectance.

Fine sediment inputs to the Yakima and Columbia rivers are accelerated through agricultural tillage and livestock impacts to soil structure within the uplands. Reaches 1, 2, and 3 contain upland agricultural development, though Reach 2 fields occur on the West Richland side of the Yakima River. All of these reaches have a fairly limited riparian buffer near the fields, which limits the sediment and contaminant capturing function that can protect against runoff and turbidity in the river.

Sediment transport is affected by diking of stream segments within the basin. Dikes reduce spring flooding and associated sediment deposition within the surrounding floodplain. Dike grading occurs within reaches 8 through 10 along the Columbia River to protect residential and commercial properties as well as infrastructure. The dikes are topped with multi-use trails throughout much of the shoreline, allowing for public recreation and enjoyment of the waterfront.

5.1.3 Water Quality

5.1.3.1 Ecosystem Process

The combined processes that deliver, transport, and store water and sediment in the ecosystem have a substantial impact on water quality. Impacts to water quality occur through land cover changes and development, chemical use in agriculture and recreation, pathogens from waste, temperature, and natural processes such as plant respiration.

Human-induced changes to water quality (e.g., industrial effluents, sewer overflows, and runoff from upland areas) can alter river and lake water temperatures, turbidity, and oxygen content, as well as nutrient, toxin, and pathogen concentrations (Karr 1995; Welch and Lindell 2000). In general, these changes can affect the presence, abundance, and vitality of all aquatic organisms. Water delivery and water quality is affected by soil loss, soil compaction, and road and building construction typically associated with development and urbanization. These activities increase the amount of impervious surface (e.g., parking lots and roads), reduce the percolation of precipitation into the ground, and concentrate pollutants into stormwater discharge areas. Reduced water infiltration increases the amount and rate of surface water runoff, causing high stream discharge or high direct delivery of water to the stream and lake shorelines (Dunne and Leopold 1978; Arnold and Gibbons 1996; Poff et al. 1997).

Fertilizers, pesticides, and automobile- and boat-generated pollutants are linked to runoff-borne pollution that enters streams and lakes. These toxins can settle in river pools, contaminating the sediments of the benthic zone. This leads to toxins either directly affecting benthic species through illness and mortality, or indirectly affecting aquatic and terrestrial species through bioaccumulation from animals lower on the food chain.

Many pathogenic protozoa, bacteria, and viruses can be found in the environment. These come from fecal material of wildlife and domesticated animals deposited within upland areas that drain into aquatic ecosystems or deposited directly into them (Sherer et al. 1992; Stanley et al. 2005). Development near the Yakima and Columbia rivers increases the potential for pathogens to be added to the system because of increased impervious surface runoff, as described above.

Solar energy input can be another important factor that impacts water quality, especially in the summer when high temperatures coincide with high nutrient loads from agricultural runoff and lower river flows. This can result in high water temperatures and very low levels of dissolved oxygen, both of which can alter the ecology of rivers and streams. Water temperature, a physical characteristic, affects the chemical process of breaking down organic material into nutrients, as well as the biological processes of phytoplankton and zooplankton reproduction and the metabolism of fish species.

Water temperatures, plant respiration, and biological decomposition are also inversely related to dissolved oxygen levels, which play a critical role in supporting aquatic organisms such as salmonids. Similarly, alkalinity/pH and nutrient concentrations influence biological processes, particularly phytoplankton production.

5.1.3.2 *Conditions in Richland*

Water quality listings for the Yakima River include those for pH, DDE, and DDT. Causes of these listings are most likely due to surrounding agricultural uses and return flows from irrigation canals upstream from Richland. The Columbia River is on the 303(d) list of impaired waters for temperature within the planning area. Additionally, the Columbia River has a TMDL for total dissolved gas and is a 305(b) water of concern for pH. Features within the City that may contribute to water quality concerns include impervious development over and near the river, recreational boating and herbicide and pesticide use in residential landscaping.

5.1.4 *Habitat*

5.1.4.1 *Habitat Structures*

Habitat is the natural environment in which particular species or populations have adapted to live. Habitat provides the physical conditions and biological functions needed to support the species as part of a larger ecosystem. The lifecycles of aquatic, avian, and terrestrial species are often interdependent, meaning that the habitat requirements of a single species include other species on which they depend. The habitat requirements vary for different species and can vary for different life stages of a species.

Habitat is often described in terms of the functions of reproduction, forage, and shelter (Morrison 1992).

- The reproduction needs of species vary greatly. All species have specific needs for areas to find a mate, reproduce, and successfully rear offspring (often referred to as breeding sites, birthing areas, and nest sites). Some species have very specific needs; for example, amphibians (frogs, toads, and salamanders) require water or moist areas for laying eggs and for larval development.
- Forage includes water and food sources. Water is a universal need of all species, while forage needs vary greatly by species. An important consideration is whether a species is prey or a predator. Predators obviously require that the habitat needs for prey species are met.
- Shelter includes areas for safe resting, refuge or cover from predators, and shelter from environmental hazards (e.g., daytime or nighttime temperatures, extreme weather events, seasonal climate fluctuations, and unpredictable disturbances such as drought, fire, or flooding).

5.1.4.1.1 Aquatic Habitat

Some of the ecosystem features that are generally applicable to Yakima and Columbia River fish habitat include water temperature; water depth; instream cover, including larger rocks and wood; substrate size; instream and riparian vegetation; floodplain health; water quality; and migration access.

Freshwater fish in the Yakima River include cold water fish (including trout and salmon) that have an upper lethal limit of approximately 25 °C, introduced species such as brown trout that can tolerate slightly warmer waters (upper limit of approximately 28 °C) , and warm water fish (largemouth bass) that can tolerate temperatures as high as 36 °C (Morrow and Fischenich 2000). Freshwater fish in the Columbia also include warm and cold water species.

Water depth requirements vary by species and life stage; in general, shallow water depths are needed for migration and spawning for salmonid species. Substrate requirements can vary by species, but many fish cannot reproduce in substrate smaller than gravel.

Instream cover increases the structural complexity of a system through wood and larger rocks that improve the habitat quality for most fish. Instream vegetation, similar to instream cover, can improve habitat as long as the amount of aquatic vegetation does not create a low dissolved oxygen issue; in general, native aquatic vegetation provides quality vegetated aquatic habitat while introduced species such as Eurasian watermilfoil (*Myriophyllum spicatum*) does not.

Riparian vegetation stabilizes banks, reduces summer temperatures, and provides nutrients through leaf debris and insect fall, and provides instream cover through tree fall where trees exist along Yakima and Columbia River shorelines. Floodplain habitat is required for many fish species during multiple life stages. Extensive and unaltered floodplains that are accessible to fish species are ideal.

Water quality constraints to fish survival include low dissolved oxygen conditions (less than 3 parts per million [ppm] in warm water streams, or less than 5 ppm in cold water streams), very low alkalinity, or high turbidity conditions (Morrow and Fischenich 2000).

5.1.4.1.2 Terrestrial Habitat

Shrub-steppe upland habitat is the largest native land cover type in Benton County and is also prevalent within the City. In some areas, shrub-steppe communities abut or nearly abut the shoreline. The largest shrub-steppe plant association type in the Yakima Basin is the big sagebrush-bunch wheatgrass association. The habitat structure of this association includes an overstory of 6 foot tall big sagebrush, an understory of bluebunch wheatgrass and Sandberg's blue grass, and groundcover dominated by algae, lichens, and moss providing a microbotic crust (Link et al. 2006).

Riparian areas are prevalent within the City, and this habitat has greater structural diversity and productivity in terms of organic material than adjacent upland areas. Habitat characteristics of healthy riparian areas include a connected corridor for fish and wildlife travel, vegetation types adapted to wetter soils, occasional flooding, and natural disturbance regimes. Riparian areas also offer important functions for species that inhabit the shrub-steppe, as well as species more limited in range to the riparian zone. For shrub-steppe

species, they provide a critical water source and often provide a more productive environment for forage, escape, thermal cover, and nesting sites. For many species, they provide critical winter habitat. Riparian areas typically support larger flocks and a greater density of upland birds than shrub-steppe habitat because of the greater production of biomass and the more complex mosaic of vegetation (Stinson and Schroeder 2012).

Movement corridors are crucial to wildlife and may be seasonal, depending on the species. The primary function of a corridor is to connect disjunctive areas of habitat by allowing migration and dispersal between the areas. Movement corridors provide the following functions essential to healthy wildlife populations:

- Provides connectivity and, thereby, genetic variation and biodiversity between differing populations and habitats, connects isolated habitats, and may allow recolonization of extirpated species
- Provides varying habitats for migration patterns (e.g., foraging, mating and nesting, rearing, shelter, and wintering) and allows populations to move in response to habitat changes such as fires
- Can provide habitat for “corridor dwellers”—species that live within corridors for extended periods (Beier and Loe 1992)

Irrigated agriculture provides for greater productivity in areas converted from shrub-steppe vegetation. Irrigated pasture, for example, produces much higher biomass than native shrub-steppe in arid areas and, therefore, greater potential forage. Such agricultural areas may support a greater number of wildlife, while at the same time displacing native species because their specific lifecycle needs are not met. Agriculture also may change the predator and prey community that affects native species. Agricultural landscapes typically support much higher rodent populations. This larger population in turn supports higher populations of predators, such as raptors, that also support native species. This artificially higher population of predators may substantially change the balance between native species and introduced species more adapted to human alteration (Dunn 1978; Moulton 2006).

The removal of native riparian vegetation, the introduction and proliferation of invasive plant species, like Russian Olive, and the filling or degradation of wetlands along shorelines impacts the organic inputs that fuel production of the lower levels of the food chain and,

therefore, can have impacts throughout the entire food web. Organic matter produced by these habitats supports terrestrial and aquatic insects and other organisms that are then eaten themselves by birds, juvenile salmonids, and other fish species. An example of invasive plants is the aquatic plant Eurasian water milfoil, which can cover lake bottoms and out-compete the native aquatic species (altering the plant community), deplete dissolved oxygen, and lead to fish mortality (Frodge et al. 1995).

Habitat fragmentation, through the building of roads, utility corridors, agricultural and urban development, and irrigation channels can affect, in varying degrees, aquatic ecosystems and habitat types. Dam development upstream of the City has altered waterbodies and wood recruitment and transport within the Yakima River basin. Urban and agricultural development has resulted in loss of shrub-steppe habitat, habitat degradation, and fragmentation.

Plants and animals are adapted to natural light intensities and timing of lighted periods. Human-induced alterations to light transmission can interfere with plant production and aquatic animal behavior. Light energy affects water temperature, animal behavior (such as the relationship between predators and prey), and plant photosynthesis and growth (Tilzer et al. 1975). Natural light is altered when riparian vegetation is removed or when structures such as docks are built that create shade and prevent natural light from reaching the water. Reductions in this natural light preclude plant colonization and growth beneath these structures and can cause changes in animal behavior. For example, shade cast by overwater structures may disrupt juvenile salmon migration in the Yakima River by creating visual barriers to their movement (Carrasquero 2001). Natural light can also be reduced by the presence of algal blooms caused by excess nutrient additions that can collect in slack water areas.

Artificial light refers to the light that humans create at night, such as lights used for roads, parking lots, industrial complexes (including dams), houses, docks, piers, and sports fields. This light can interfere with aquatic and terrestrial animals' routines and change predator-prey relationships.

5.1.4.2 *Conditions in Richland*

5.1.4.2.1 Aquatic Habitat

The aquatic areas of the Yakima River throughout Richland support concentrations of wintering migratory waterfowl, primarily as a resting and feeding area for dabbling ducks, primarily mallard, Canada goose, canvasback, ring-necked duck, and wood duck. Some nesting likely occurs in areas with wider riparian buffers. The Columbia River also provides a breeding area for long billed curlew and a variety of gulls, as well as a resting area with limited nesting for great blue heron and egret.

Several fish species populate the Yakima and Columbia rivers within Richland. Salmonid fish include steelhead (*Oncorhynchus mykiss*) and spring and fall Chinook salmon (*Oncorhynchus tshawytscha*). Coho salmon (*Oncorhynchus kisutch*) were historically present here, and a coho reintroduction program is currently underway in the Yakima River Basin. Bull trout (*Salvelinus confluentus*) were historically present and abundant in upper tributaries of the Yakima River basin and may now occur in this portion of the river in low numbers. Pacific lamprey (*Lampetra tridentate*) are present but have experienced population decline in recent years.

Resident fish include small (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*), northern pikeminnow (*Ptychocheilus oregonensis*), sculpin (*Cottoidea* sp.), mountain whitefish (*Prosopium williamsoni*), white sturgeon (*Acipenser transmontanus*), catfish (*Ictalurus punctatus*), sucker (*Catostaomidae* sp.), walleye (*Sander vitreus*), chiselmouth (*Acrocheilus alutaceus*), dace (*Leuciscus leuciscus*), common carp (*Cyprinus carpio*), redbreast shiner (*Richardsonius balteatus*), peamouth (*Mylocheilus caurinus*), and various minnow species. Shellfish include the Columbia River limpet, spire snail and California floater. Invasive species found in the Yakima and Columbia rivers include bluegill, bass, crappie, shad, carp, channel catfish, perch, and walleye.

Limitations to aquatic habitat in Richland are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams, though no dams are present in the City.

The following aquatic restoration opportunities are common to the lower Yakima River in this area:

- Improve migration conditions in the lower Yakima River by changing hydrograph through artificial storage
- Reconnect floodplain/side channels and oxbows near this reach, and investigate leasing/purchasing floodplain areas
- Reduce influence of predatory fishes such as smallmouth bass and northern pikeminnow
- Increase spawning habitat for salmon by reducing water stargrass, an invasive plant that leads to fine sedimentation
- Retain and recruit large woody debris or engineered logjams into the lower Yakima River to restore and enhance fish habitat, taking into consideration the risk of possible predation issues on juvenile salmonids
- Restore riparian buffers where possible
- Update irrigation intakes, as applicable, for protection of salmon from uptake and impingement

5.1.4.2.2 Terrestrial Habitat

Richland is dominated by developed land cover (42 percent of total area) and shrub-steppe vegetation (31 percent of total area). Agriculture areas make up approximately 18 percent of the total land cover and croplands are largely located in former shrub-steppe, riparian, and floodplain habitat. The shrub-steppe habitat provides many ecosystem services including soil stabilization, wildfire moderation, and overall biodiversity. The displacement of shrub-steppe plant species by the invasive cheat-grass (*Bromus tectorum*), Russian thistle (*Salsola tragus*), and other invasive species, in particular, increase fire intensity and frequency, which in addition to the hazards this creates for humans and wildlife also impacts the dominant shrub-steppe plant species big sagebrush (*Artemisia tridentata*), an important species for rare birds such as the sage grouse (Link et al. 2006).

While undisturbed shrub-steppe habitat is very rare, moderately disturbed shrub-steppe communities are fairly common. Such areas have been affected to various degrees by grazing, exotic plant infestations, and other disturbances. About 26 percent of the relatively undisturbed shrub-steppe habitat is dominated by native grasses and sagebrush, with an

intact cryptogam crust (a thin layer of moss and lichen that indicates an undisturbed community), and contains mostly native shrubs (e.g., big sagebrush and bitterbrush) with a predominantly native grass understory. This habitat type, while damaged by grazing, off-road vehicle use, and other disturbances, still provides cover, food, and nesting habitat for many species of wildlife. These moderately disturbed shrub-steppe areas are particularly important during winter months when nearby and adjacent cultivated fields provide no vegetative cover for wildlife (YSFWPB 2004). Recommendations for preserving shrub-steppe habitat includes limiting development footprints including agricultural land cover changes, limiting road and utility corridors to avoid fragmenting habitat, restricting vegetation clearing, keeping domestic pets and livestock out of sensitive species habitat, limiting fencing to avoid barriers to native wildlife, and limiting irrigation canals through shrub-steppe habitat (Azerrad et al. 2011).

An abundant and diverse community of wildlife inhabits and utilizes shrub-steppe communities in the area. These include a variety of reptiles such as western rattlesnake (*Crotalus viridis*), Great Basin spadefoot toad, and northern sagebrush lizard; raptors such as golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), and short-eared owl (*Asio flammeus*); a variety of other birds such as long-billed curlew (*Numenius americanus*), loggerhead shrike (*Lanius ludovicianus*), sage sparrow (*Artemisiospiza belli*), Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), greater sage-grouse (*Centrocercus urophasianus*), western kingbird (*Tyrannus verticalis*), western meadowlark (*Sturnella neglecta*), mourning dove (*Zenaidura macroura*) downy woodpecker (*Picoides pubescens*); small mammals such as Townsend ground squirrel (*Urocitellus townsendii*), black-tailed jackrabbit (*Lepus californicus*), white-tailed jackrabbit (*Lepus townsendii*), and Merriam's shrew (*Sorex merriami*); and large mammals such as coyote (*Canis latrans*), badger (*Taxidea taxus*), mule deer (*Odocoileus hemionus*), and elk (*Cervus canadensis*). Historically, gray wolves (*Canis lupus*) were a top-level predator in the area, preying primarily on deer and elk. The breeding population of wolves was decimated by the 1930s as a result of the expansion of ranching and farming in the state. In the absence of natural predators, large mammals such as deer and elk have increased substantially, often in excess of the land's carrying capacity (WDFW 2011).

Riparian and floodplain areas as well as wetlands are primarily associated with the mainstem and tributaries of the Yakima and Columbia rivers although they are also present in seep

areas in shrub-steppe areas. Black cottonwood is the dominant plant species in lowland riparian areas and plays a key role in the integrity of riparian systems (USBR 2008). Other species include a variety of willow species, red-osier dogwood, aspen, water birch, serviceberry, chokecherry, rose, hawthorn, and snowberry, as well as invasive species such as Russian olive.

Reptile and amphibian species found in these habitats include western painted turtle (*Chrysemys picta*), spotted frog (*Rana pretiosa*), gopher snakes (*Pituophis melanoleucus*), garter snake (*Thamnophis sirtalis*), and others. Small mammals include beaver (*Castor canadensis*), river otter (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), porcupines (*Erethizon dorsatum*), raccoons (*Procyon lotor*), skunks (*Mephitis mephitis*), silver-haired bats, and pallid bats (*Antrozous pallidus*). River otters are occasionally observed in the Hanford Reach. Common avian species include Wilson's phalarope (*Phalaropus tricolor*), belted kingfisher (*Megaceryle alcyon*), peregrine falcon (*Falco peregrinus*), and downy woodpecker (*Picoides pubescens*). Species of waterfowl that utilize the wetland and riparian habitats within the affected area include mallard (*Anas platyrhynchos*), American wigeon (*A. Americana*), and others (USFWS 2008, 2012).

Both the Lower Yakima Basin and the Pasco Basin are located in the Pacific Flyway and serve as a resting area for neotropical migrant birds, migratory waterfowl, and shorebirds. During the fall and winter months, ducks (mallard (*Anas platyrhynchos*), common merganser (*Mergus merganser*), gadwall (*Anas strepera*), blue-winged teal (*Anas discors*), cinnamon teal (*Anas cyanoptera*), redhead (*Aythya americana*), American wigeon (*Anas americana*) northern shoveler (*Anas clypeata*); and Canada geese (*Branta canadensis*) utilize shorelines. The Columbia River Islands in Richland and along the Hanford Reach support large migratory populations. Other species observed in the area include great blue heron (*Ardea herodias*), American white pelicans (*Pelecanus erythrorhynchos*), egrets (*Bubulcus ibis*), double-crested cormorants (*Phalacrocorax auritus*), coots (*Fulica americana*), and common loons (*Gavia immer*) (USFWS 2008, 2012).

In the Lower Yakima River Basin/Pasco Basin wildlife resources are positively affected by several large public land holdings, including the Hanford Site, the Hanford Reach National Monument (HRNM) and the Fitzner-Eberhart Arid Lands Ecology Preserve (FEALE), all of which provide a large contiguous range for native species.

For City shorelines, several factors affect the suitability of wildlife habitat.

- Local shoreline habitat is connected to the biological reservoir of native species in large public land holdings to the north in the HRNM and Department of Energy Hanford Site. Currently there are few barriers to wildlife movement down the Columbia River to North Richland. Connections from the ALEP are provided over federal, state, and City-owned lands in the Horn Rapids area.
- Wildlife connections also are provided along much of the Yakima River floodplain where agricultural activities and low-intensity residential use provide relatively few barriers to wildlife movement.
- The quality and size of habitat areas in floodplains in the Yakima River Delta and the extent of human disturbance in those areas determines the range of native and introduced populations. These areas among the most productive habitat areas in the Lower Yakima Basin. They are large enough to provide a range of breeding, forage, and shelter for small species, including reptiles, amphibians, small mammals, and birds. These areas, however, are not large enough to provide all of the resources that would support year-round use by large mammals, although animals may pass through the area and use these areas as corridors to connect with other habitat areas. Mule deer do use the Yakima Delta for breeding.
- Connections along Columbia River may be provided by public open space. It is likely, however, that this side of the river is not used as extensively as a migration corridor compared to that the opposite bank in Franklin County, which features lower-intensity agricultural and large-lot rural residential uses.
- Urban development near the open space areas along the Columbia River largely limits the use of those areas to species tolerant of human disturbance.
- The Columbia River shoreline south of Leslie Groves Park provides narrow and managed areas of riparian vegetation with low present and potential habitat value and little potential for movement corridors.
- Islands in the Columbia River that are part of the McNary National Wildlife Refuge provide resting areas for a range of migratory wildlife. The river provides a substantial buffer from human disturbance.

- Ongoing efforts to enhance existing habitat in areas where past disturbance has occurred, together with limiting access to critical nesting areas provides the potential to substantially enhance habitat values in existing floodplain areas.

5.2 Reach Characterizations

Characterization of shoreline reaches and subreaches are provided in Appendix A. These reach and subreach characterization tables summarize existing physical conditions; characterizations and analyses for water quantity and sediment, water quality, and habitat and species; ecological functions analysis, including identifying functional conditions, stressors, and restoration and protection opportunities; preliminary shoreline environment designation considerations; existing public access and potential additional public access opportunities; and cumulative impact considerations.

Each reach was categorized overall in terms of ecosystem function. The categories include functioning, partially functioning, or impaired. The framework, definitions, and categories for this analysis were adapted from a system originally developed for Riparian Area Management guidelines proposed by the U.S. Bureau of Land Management (BLM; Prichard 1998). This assessment is a relative assessment with some degree of calibration to reflect the overall conditions found in the City.

The potential ecological function is defined as the highest ecological status a shoreline reach can attain given no development or management constraints, but does take into account the extent to which management (particularly water management) supports ecological function. This is a distinction that is fairly important in the Yakima River, where the management, storage, diversion, use, and reclamation of water for agriculture, hydropower, and other uses has a substantial effect on the amount of shoreline as well as the overall function of those shorelines.

Ecological function is defined here as the degree of similarity between existing physical and biological conditions, and the potential ecological function of a site; the higher the ecological function, the closer the site is to potential. Potential, for this assessment, encompasses all the resources defined by the interaction of hydrology, vegetation, water quality, and erosion/deposition (soils), and aquatic and riparian habitat. For example, the potential of the

hydrologic component includes the concept of a stream channel's physical characteristics (dimension, pattern, and profile) being within a "normal or usual" range (e.g., entrenchment, sinuosity, width, depth, and slope of the bankfull channel) as defined by landform and geomorphic stream type given current flows.

- Functioning is a state of resiliency that will allow a shoreline to hold together during high-flow events with a high degree of reliability. This resiliency allows an area to then produce desired values, such as fish habitat, bird habitat, or forage, over time. Riparian-wetland areas that are not functioning properly cannot sustain these values over time and are susceptible to stochastic disturbances such as fire.
- Partially functioning is a state in which the ecological function of the shoreline is somewhat compromised by development or management trends, or is particularly susceptible to future degradation due to development, management or ecological conditions. A partially functioning shoreline has some ability to recover through changes in management or the removal of identified stressors on ecological function.
- Impaired is a state in which the ecological functions of the shoreline are heavily compromised by development or management of the reach. An impaired reach has a low probability of recovery, through restoration, due to the degree of structural change to the shoreline, waterbody, and surrounding shorelands. Impaired shorelines can be functionally improved, but are unlikely to be self-sustainable.

6 PUBLIC ACCESS

The Reach Characterization Tables in Appendix A describe public access for each reach in the City and its unincorporated UGA.

The Yakima River shoreline has agricultural lands and open spaces along it, with some publicly owned park and recreation facilities along the lower river and at the confluence with the Columbia River. A regional plan for 30 miles of connected parks and open space has been developed and is called the Tapteal Greenway Plan. Much progress has been made to implement this plan, and continued implementation will result in added and improved shoreline public access.

In general, the City has excellent waterfront shoreline access along most portions of the Columbia River with boating facilities, trails, and active and passive recreation opportunities. Park master plans such as for Columbia Park West will allow for additional and improved facilities. An area where future shoreline access and open space is minimally found is in the North Richland UGA. This area is part of the existing Hanford 300 Area. As development occurs in this area, incorporating shoreline access may be appropriate to meet future demand for access created by the development.

7 INFORMATION SOURCES, ASSUMPTIONS, AND LIMITATIONS

This document is based on the best information available to the City at the time this document was produced. This information was obtained from a variety of sources and was collected and prepared for a variety of different purposes. The information was collected over a long time period; however, a substantial effort was made to use the most accurate and current information available.

Existing data, reports, and information used for the shoreline inventory are shown in the reference section. Generally, the documents used include City-comprehensive plans and municipal codes, USFWS and Washington State Department of Fish and Wildlife (WDFW) subbasin and habitat conservation plans, historical references, and scientific literature on ecological functions. GIS data illustrated in the map folio includes information on hydrology, soils, topography, vegetation, land cover, priority habitat and species concentrations, and other features.

This report relied largely on GIS data and remotely sensed imagery. Integrating various GIS layers together into map folio projects often resulted in polygon boundary discrepancies. Rectification of these discrepancies was only conducted for layers and geographic locations most relevant to the SMP update. For example boundaries for zoning or land use designations do not always match identified OHWM. The identified shoreline jurisdiction areas are only an approximation for purposes of updating the SMP for the City. Precise OHWM delineation and associated shoreline jurisdiction boundaries will be determined on a project-by-project basis, based on site-specific analysis during the proposal development application and review process.

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APPENDIX A

REACH CHARACTERIZATION TABLES

RICHLAND		CITY OF RICHLAND
REACH 1	Reach Length: 0.86 mile	
Shoreline Jurisdiction: 48.63 acres		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends about 4,000 feet along the left bank of the Yakima River and is agricultural land owned by the City of Richland; it is currently in agricultural use.</p>		
PHYSICAL CHARACTERISTICS		
Ownership: City of Richland		
Existing Land Cover/Development: Existing irrigated agriculture		
<p>Land Use/Current SMP: Current SMP Environment Designation: Conservancy Current Zoning: Agriculture Current Land Use: Agriculture Water-dependent Uses: None Water-related Uses: None Non-water related Uses: Agriculture Future Land Use: No change from agricultural use is projected.</p>		
Major Infrastructure: Side roads and trails along the shoreline, Horn Rapids Ditch irrigation canal (recently replaced with underground piping), boat ramp		
<p>Geomorphic Character: Reach 1 is a relatively short reach located on the east bank (left bank) of the Yakima River at the upstream extent of the City of Richland. It is a confined, single-thread channel, with channel banks and margins that consist of flood deposits. The high bank rises steeply from the channel margins. This reach is located in an alluvial valley and has a slope of 2% to 15%. Soils are loamy fine sand, with a gravelly</p>		

RICHLAND	CITY OF RICHLAND
<p>substratum.</p> <p>Hardened banks: No significant armoring was noted during inspection of aerial photography.</p>	
<p>Flooding and Geological Hazards: This reach is adjacent to FEMA High Risk Flood Areas and the majority of the east bank is mapped in this category. Geologic hazards are identified as a low flooding risk due to historical channel migration patterns and the location of a small freshwater emergent wetland along the east bank. There is a slight potential for erosion as the bank has a 2% to 15% slope and the soils contain a gravelly substratum.</p>	
<p>Channel Migration Zone: The CMZ is narrow and follows along the perimeter of the high left bank comprised of flood deposits. There is limited floodplain along the left bank, with flooding mostly confined to the channel. The channel is aligned along the toe of this high bank with limited potential for channel migration into the left bank.</p>	
<p>REACH CHARACTERIZATION AND ANALYSIS</p>	
<p>Water Quantity and Sediment: Water quantity is mainly dependent on releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow. There are no major surface water inputs or outputs in this reach.</p>	
<p>Water Quality: There are water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from 4A in 2005 because the Lower Yakima pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). Water quality is not likely to be impacted by local sources in this reach.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>Upland species include potential nesting and foraging areas for ferruginous hawk, loggerhead shrike, and curlew. Upland species in the vicinity include burrowing owl. There is a variety of species related to wetlands and floodplains in the rural area across the river. The water area of the Yakima River supports migratory waterfowl as a resting and feeding area. The water area of the Yakima River supports concentrations of wintering migratory waterfowl, primarily as a resting and feeding area for dabbling ducks, primarily mallard, Canada Goose, Canvasback, Ring-necked Duck, and Wood Duck. Some nesting may occur.</p> <p>Because of the very limited riparian area between the water and the buried irrigation piping, there are limited opportunities along the shoreline for species with lifecycle stages related to water. On the other hand, the steep slope provides isolation from urban disturbance and may provide opportunities for reproduction, rearing, and shelter for reptiles, amphibians, and small mammals. Carrying capacities are limited due to the lack of a floodplain and the associated complex mosaic of habitat types and the limited area between the water and the buried irrigation piping.</p> <p>The area presents few limitations for movement corridors for both aquatic and terrestrial species. The low level of human activity along the shoreline and irrigation access road provide little barrier for movement. The undisturbed Department of Energy land north of Horn Rapids Road provides an area of relatively undisturbed habitat for upland species. Upland species can easily cross SR 240, Horn Rapids Road, and</p>	

RICHLAND	CITY OF RICHLAND
<p>Snyder Road, especially at night, although mortality may be substantial along SR 240.</p> <p>The National Wetland Inventory (NWI) shows small patches of riparian wetlands present in this reach. The shoreline has historically been confined due to the presence of irrigation canals (recently piped) just downstream of Horn Rapids Dam.</p> <p>Several fish species populate the Lower Yakima River in this reach. Salmonid fish include fall Chinook salmon, which are known to spawn in this reach, spring Chinook, and steelhead. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima Basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern pikeminnow, sculpin, mountain whitefish, white sturgeon, catfish, sucker, walleye, rainbow trout, chiselmouth, dace, common carp, and various minnow species.</p> <p>Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams.</p>	
<p>ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)</p>	
<p>Level of Existing Function: Partially functioning</p> <p>Stressors: Channel migration is limited by infrastructure (e.g., roads and ditches), and the Horn Rapids dam upstream limits sediment transport into the reach.</p> <p>Potential Restoration Opportunities: Identify opportunities to provide high-flow refuge and increase riparian planting density.</p> <p>Potential Protection Opportunities: Maintain existing riparian and wetland buffers.</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Conservancy</p>	
<p>PUBLIC ACCESS</p>	
<p>Existing Public Access:</p> <p>WDFW has a primitive boat launch at Snively Road within or immediately abutting the south end of the reach (WDFW 2012). This launch/water access area is considered a link in the Tapteal Greenway Plan, a 30-mile corridor promoting habitat conservation and public access along the Yakima River (Tapteal 2012).</p>	
<p>Existing Public Access Goals:</p> <p>The Richland Comprehensive Land Use Plan (City of Richland 2008) includes a Land Use Element referencing the Tapteal Greenway Plan and includes a goal to promote regional cooperation in developing an open space network:</p> <p style="padding-left: 40px;"><i>“OS Policy 1 - Work with other jurisdictions, property owners, open space groups and all interested parties to develop a broadly accepted regional open space plan and appropriate implementation strategies.”</i></p>	

RICHLAND	CITY OF RICHLAND
<p>Identified Public Access Improvements:</p> <p>The Tapteal Greenway Trail is a conceptually planned improvement along the length of the reach (Tapteal 2012; Ridges to Rivers Open Space Network Steering Committee 2011). Richland’s Capital Facilities Element (Richland 2008) references the Tapteal Greenway Plan and incorporates its improvements into the City’s Capital Facility Element:</p> <p style="padding-left: 40px;"><i>“The Tapteal Greenway Plan outlines activities and facilities to be constructed at each of these sites. The Plan states that these facilities should become a component of each jurisdiction’s comprehensive plan. Accordingly, these facilities are included in the Capital Facilities Element.”</i></p>	
<p>CUMULATIVE IMPACT CONSIDERATIONS</p>	
<p>Watershed level: The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts, and upriver degradation of water quality conditions. Richland’s focus should be on preventing further degradation of Lower Yakima conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Water quality impacts from impervious surface runoff from nearby transportation facilities and from herbicide and fertilizer run-off 	

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RICHLAND		CITY OF RICHLAND
REACH 2	Reach Length: 0.58 mile	
Shoreline Jurisdiction: 14.06 acres		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends about 3,000 feet along the left bank of the Yakima River on an outer oxbow with a very narrow band of riparian vegetation on a steep slope up from the river. At the top of the slope is the Bluffs subdivision, which is part of the Horn Rapids Golf Course development. Shoreline Management Act jurisdiction of 200 feet from the OHWM extends to just below the top edge of the slope.</p>		
PHYSICAL CHARACTERISTICS		
<p>Ownership: Land immediately adjacent to the river is open space dedicated as part of the subdivision with a conservation easement to the City of Richland.</p>		
<p>Existing Land Cover/Development: Open space</p>		
<p>Land Use/Current SMP:</p> <p>Current SMP Environment Designation: Conservancy</p> <p>Current Zoning: Natural Open Space and Residential</p> <p>Current Land Use Land Use: Residential and golf course</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: Residential and golf course</p> <p>Future Land Use: No change from current use is projected.</p>		
<p>Major Infrastructure: Informal trail or dirt road halfway up shoreline bank</p>		

RICHLAND	CITY OF RICHLAND
<p>Geomorphic Character: Reach 2 is a short segment located on the east bank (left bank) of the Yakima River. It is a confined, single-thread channel located along the outside apex of a tight meander bend. The river banks are high and steep and consist of both alluvium and flood deposits. The soils are comprised mostly alluvial and flood deposits of loamy sand. The river is constrained by farmland and local roads, and historical photos indicate very little movement on the east bank between 1952 and 2011. Channel migration occurred on the opposite bank more noticeably onto farmland.</p> <p>Hardened banks: No armoring, but steep graded bank makes up the entire shoreline area</p>	
<p>Flooding and Geological Hazards: This reach is mapped within the FEMA High Risk Flood Area and supports freshwater emergent wetlands and forested/shrub wetlands. Geologic hazards include a low risk of flooding. Flooding is unlikely due to historical channel migration patterns.</p>	
<p>Channel Migration Zone: The channel migration zone in Reach 2 is narrow and follows along the perimeter of the left bank (outside of the meander bend). The left bank is very high and comprised of alluvium and flood deposits. There is limited floodplain, with flooding confined to the channel. The channel is aligned along the toe of this high bank with limited potential for channel migration into the left bank.</p>	
REACH CHARACTERIZATION AND ANALYSIS	
<p>Water Quantity and Sediment: Water quantity is mainly dependent on releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow. There are no major surface water inputs or outputs in this reach, except perhaps for shallow groundwater returns from the upstream Barker Ranch area.</p>	
<p>Water Quality: Water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from 4A in 2005 because the Lower Yakima pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). A nearby golf course and impervious surfaces from roads and residential roofs may contribute to likely limited stormwater runoff in Reach 2. Shallow groundwater returns to the river from the upstream Barker Ranch could reduce water temperature in this reach.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>There are no threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Yakima River throughout this reach supports concentrations of wintering migratory waterfowl, primarily as a resting and feeding area for dabbling ducks, primarily mallard, Canada Goose, Canvasback, Ring-necked Duck, and Wood Duck. Some nesting may occur.</p> <p>Because of the very limited riparian area between the water and the canal, there are limited opportunities along the shoreline for species with aquatic lifecycle stages. On the other hand, the steep slope isolates the area from urban disturbance and may provide opportunities for reproduction, rearing, and shelter for reptiles, amphibians, and small mammals. Carrying capacity is limited by the lack of a floodplain and the associated complex mosaic of habitat types and the limited area between the water and the canal. Proximity impacts such as noise, light, and glare, as well as predation from domestic animals related to adjacent urban use, likely limit productivity of adjacent areas.</p>	

RICHLAND	CITY OF RICHLAND
<p>The area presents few opportunities for movement corridors for terrestrial species. The high level of human activity above the slope likely limits both habitat and the potential for movement by species except birds and flying insects. The residential development and golf course is an effective barrier for movement between the river and undisturbed Department of Energy land to the north.</p> <p>The National Wetland Inventory (NWI) shows small patches of riparian wetlands present in this reach. The shorelines are natural and are flanked by residential areas to the north and agriculture to the south.</p> <p>Several fish species populate the Lower Yakima River in this reach. Salmonid fish include fall Chinook salmon, which are known to spawn just southwest of this reach, steelhead, and spring Chinook. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima Basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern pikeminnow, sculpin, mountain whitefish, white sturgeon, catfish, sucker, walleye, rainbow trout, chiselmouth, dace, common carp, and various minnow species.</p> <p>Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
<p>Level of Existing Function: Partially functioning</p> <p>Stressors: Upland residential development (just outside the shoreline jurisdiction boundary) and recreation use</p> <p>Potential Stressors: Medium density residential allows for 10 dwelling units per acre</p> <p>Potential Restoration Opportunities: Consider options to restore vegetation on cut bank to prevent unnatural deposition of sediment</p> <p>Potential Protection Opportunities: Limit encroachment by upland residential uses, and evaluate potential opportunities for protecting water quality from golf course operations</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Conservancy</p>	
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>The public Horn Rapids Golf Course lies along Reach 2 (City of Richland 2012).</p>	
<p>Existing Public Access Goals:</p> <p>See Reach 1 regarding the City's overall goal to develop and implement a regional open space plan.</p>	
<p>Identified Public Access Improvements:</p> <p>Similar to Reach 1, the conceptual Tapteal Greenway Trail is planned to continue along this reach.</p>	

RICHLAND	CITY OF RICHLAND
CUMULATIVE IMPACT CONSIDERATIONS	
<p>The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts and upriver degradation of water quality conditions. Richland’s focus should be on preventing further degradation of Lower Yakima conditions.</p>	
<p>Reach level:</p>	
<ul style="list-style-type: none"> • Impacts from potential development along the shoreline in residential areas • Water quality impacts from potential herbicide and fertilizer use on irrigated landscaped lawn, golf course and garden areas • Potential for vegetation alterations from existing development • Other impacts from non-native predation (domestic pets, smallmouth bass, and pike minnow) 	

References:

City of Richland. 2012. 2012 - 2018 Final: Parks, Trails and Open Space Master Plan. Available at: <http://www.ci.richland.wa.us/index.aspx?nid=227>. Accessed in December 2012.

RICHLAND		CITY OF RICHLAND
REACH 3	Reach Length: 4.56 mile	
Shoreline Jurisdiction: 896.32 acres (approx.)		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends about 4 miles along the left bank of the Yakima River from north of Glen Road to the I-182 bridge. Land use is largely agriculture or large lot rural lands in lots of 2 to 10 acres to the border of the W.E. Johnson Park at about the alignment of Swift Boulevard. The park and lands to the south are in public ownership. This area is largely floodplain that ranges up to $\frac{3}{4}$ of a mile wide to Glen Briar Lane. Between this point and the bridge, there is a narrow riparian corridor bounded by a steep slope.</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Begins at the City Limits and extends to the south to a flood channel at about 1.5 river miles south of the Van Giesen Street Bridge</p> <p>SR B: Extends approximately 0.8 miles to approximately the alignment of Glen Briar Lane</p> <p>SR C: Extends approximately 1.5 miles to the I-182 bridge</p>		

RICHLAND	CITY OF RICHLAND
PHYSICAL CHARACTERISTICS	
Ownership: Private land within the majority of SR A, City land within SR B, and federal ownership along shoreline of SR C	
Existing Land Cover/Development: Irrigated agriculture, native riparian land cover, and floodplain open space	
<p>Land Use/Current SMP:</p> <p>Current SMP Environment Designation: Rural, except for Conservancy at Fox Island (SR A); Conservancy (SRs B and C)</p> <p>Current Zoning: Agriculture, floodplain, park and public facility, and natural open space</p> <p>Current Land Use Land Use: Agriculture, large lot residential, public park, and open space</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: Agriculture, residential, park and open space</p> <p>Future Land Use: No change from existing land use is projected. Some larger lots may be sub-dividable.</p>	
Major Infrastructure: Public water access, public water system, W.E. Johnson Park, SR 224 and crossing, and I-182 and crossing.	
<p>Geomorphic Character: Reach 3 is a long segment located on the east bank (left bank) of Yakima River that extends downstream to the I-182 Bridge. This river reach is a meandering, mostly single-thread, low gradient channel. At the upstream extent, the SR 224 (Van Giesen Street) Bridge crossing constricts the channel. Based on the available LiDAR coverage and historical air photos, the river has migrated through its valley in this reach, as evidenced by old channel scars. Geologic units are primarily alluvial deposits. Soils consist of fine loamy sand, loamy sand, and loamy fine sand.</p> <p>Hardened banks: Armoring includes bridge abutments for I-182 and SR 224.</p>	
Flooding and Geological Hazards: Approximately 25% of this reach is mapped within the FEMA High Risk Flood Area. Geologic hazards are primarily a low risk of flooding as evidenced by historical photos.	
<p>Channel Migration Zone: Reach 3 is a long reach along the left bank of the Yakima River and includes multiple bridge crossings. The CMZ is wide in places where the channel is not confined by infrastructure and where the floodplain is wide and made of erodible materials (alluvium and soils comprised of sand). Areas of the reach include old meander bends that consist of mostly low ground that is included in the floodway. The CMZ narrows where infrastructure (highways) limits the migration potential.</p>	
REACH CHARACTERIZATION AND ANALYSIS	
Water Quantity and Sediment: Water quantity is mainly dependent on releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow. There are no major surface water inputs or outputs in this reach.	

RICHLAND	CITY OF RICHLAND
<p>Water Quality: There are water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from A in 2005 because the Lower Yakima pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). Nearby agricultural land may contribute surface runoff in SR A, and nearby impervious surfaces from roads and residential roofs may contribute stormwater runoff in SR C.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Yakima River throughout this reach supports concentrations of wintering migratory waterfowl, primarily as a resting and feeding area for dabbling ducks, primarily mallard, Canada Goose, Canvasback, Ring-necked Duck, and Wood Duck. Some nesting may occur.</p> <p>SR A: Shoreline riparian habitat in this reach varies greatly according to topography and human alteration. Between the City limits and the Van Giesen Street Bridge, topography limits riparian vegetation to a relatively narrow band.</p> <p>South of the bridge, the riparian vegetation expands within the floodway, except for a short armored stretch where Van Giesen Street is adjacent to the water.</p> <p>The rural residential large lot area along the Yakima River results in riparian vegetation that varies from parcel to parcel depending on the extent of upland clearing. The floodway in this area includes an overflow channel to the east with a more complex mosaic of vegetation and habitat. Except for the overflow channel, most upland vegetation is mowed pasture. Proximity impacts such as noise, light, and glare and predation from domestic animals related to adjacent large lot use likely further limits productivity of adjacent areas.</p> <p>Upland species include potential nesting and foraging areas for ferruginous hawk, loggerhead shrike, and curlew. Upland species in the vicinity include burrowing owl. A variety of species related to wetlands and floodplains are present in the floodplain and wetland complex.</p> <p>Because of the change in vegetation cover, limited riparian vegetation, and proximity of single-family residences, the area along the shoreline provides limited habitat for reptiles, amphibians, and small mammals that depend on water for lifecycle functions. The limited riparian vegetation and associated mosaic of habitat types likely limits functions largely to foraging.</p> <p>The area presents moderate limitations for movement corridors for terrestrial species other than birds. The level of human activity from low intensity residential use and the traffic on Van Giesen Street likely limit daytime crossings to the vicinity of the bridge over the river and the bridge over the overflow channel. The highway and roads in the vicinity, however, are not a physical barrier to movement by most animals, especially at night, although mortality from vehicle collisions likely is moderate to high. Upstream of the Van Giesen Bridge, the low intensity development on Fox Island and the West Richland Golf Course on the right bank likely provides a less constrained corridor. South of the bridge the left bank in Richland provides the most effective potential corridor for movement because of the levee on the right bank in West Richland.</p>	

RICHLAND**CITY OF RICHLAND**

SR B: In this park and open space area, the extent of riparian vegetation is largely dependent upon topography. Several large wetland areas are present in abandoned channels within the floodplain.

The area includes a complex mosaic of riparian and upland vegetation, with some areas of shrub steppe sagebrush and grasses. Floodway and riparian areas include native trees and shrubs including Cottonwood, Alder Red Osier Dogwood, and a variety of Willow species, as well as invasive species such as Russian Olive.

This area primarily provides productive floodplain and wetland habitat for small resident species of reptiles, amphibians, and small mammals, particularly those with lifecycle stages dependent on water. The small area of upland shrub/steppe habitat and the inherent low productivity of such habitat limits the range of species and populations. This likely supports a small resident population, as well as providing additional habitat for mobile species that can move between a number of small habitat areas. The availability of the area to larger mammals, such as mule deer, is dependent upon preservation of migration routes, which are currently constrained both upriver and across adjacent urbanized uplands.

The area provides opportunities for movement corridors for terrestrial species; however, human activity on the trail system within the area above the bluff and the trail through the area likely limits movement to evenings and night, as well as seasons of lower human use. The urban development to the east provides little habitat or movement potential for shrub steppe species.

SR C: This subreach extends approximately 7,500 feet to the I-182 bridge. A steep slope adjacent to the river limits riparian vegetation and provides limited area and limited habitat complexity. The presence of a trail connection through the area also introduces human disturbance. This area has limited habitat value for reptiles, amphibians, and small mammals dependent on the water for specific lifecycle stages.

The area provides opportunities for movement corridors for terrestrial species; however, the high level of human activity above the bluff and the trail through the area likely limits movement to evening, night, and seasons of lower human use. The urban development to the east provides little habitat or movement potential for shrub steppe species. Proximity impacts such as noise, light, and glare from adjacent urban use likely limit productivity of adjacent areas.

The National Wetland Inventory (NWI) shows large patches of riparian wetlands present in this reach, especially concentrated near SR B. The shoreline has long expanses of natural areas in riparian areas of SR B. Shorelines in SR A are natural but are flanked by agricultural areas, and SR C shorelines are natural and surrounded by residential development.

Several fish species populate the lower Yakima River in this reach. Salmonid fish include steelhead and spring and fall Chinook salmon. Coho salmon were historically present here, and there is currently a coho reintroduction program underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern pikeminnow, sculpin, mountain whitefish, white sturgeon, catfish, sucker, walleye, rainbow trout, chiselmouth, dace, common carp, and various minnow species.

Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams.

RICHLAND	CITY OF RICHLAND
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
SUBREACH A	
<p>Level of Existing Function: Small section on right bank is functioning and rest of subreach is partially functioning</p> <p>Stressors: Upland development in shrub steppe areas, channel migration limited by highway in one segment, residential with irrigated lawns within portion of sub-reach, road crossing, agriculture irrigation practices.</p> <p>Potential Restoration Opportunities: Improve riparian buffer, consider geomorphically appropriate control of channel migration at Van Giesen, small farm buffer strips for irrigation management and water quality</p> <p>Potential Protection Opportunities: Protect low lying areas and relic channels</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Agriculture</p>	
SUBREACH B	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Minimal floodplain development and limited riparian in some areas</p> <p>Potential Restoration Opportunities: Improve consistency of riparian conditions, improve side channel connectivity, and evaluate opportunities for additional side channels</p> <p>Potential Protection Opportunities: Protect existing floodplain and riparian habitat</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Low Intensity</p>	
SUBREACH C	
<p>Level of Existing Function: Partially functioning</p> <p>Stressors: Upland development and recreation use, channel migration limited by SR 240, vegetation on cut slope near SR 240 is limited</p> <p>Potential Stressors: Single-family residential allows for 5 dwelling units per acre. Multiple-family residential allows for 10 or more dwelling units per acre.</p> <p>Potential Restoration Opportunities: Shrub steppe restoration based on WDFW guidelines, consider options to restore vegetation on cut bank to prevent unnatural deposition of sediment (particularly on cut banks just above river)</p> <p>Potential Protection Opportunities: Protect existing floodplain and riparian habitat.</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Parallel Conservancy to top of slope and Residential above slope</p>	

RICHLAND	CITY OF RICHLAND
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>SR A: WDFW provides another primitive boat launch at Hyde Road (road end) (WDFW 2012). An on-street trail traverses the river at Van Giesen Street (City of Richland 2012). Fox Island is designated as natural open space on the Comprehensive Land Use Plan (City of Richland 2008). The Tapteal Greenway Association identifies that environmental education activities take place at Tapteal Bend (access on Van Giesen just east of Yakima River Bridge). The Tapteal Bend location is part of the Tapteal Water Trail site.</p> <p>SR B: The subreach contains W.E. Johnson Park and associated trails.</p> <p>SR C: The Duportail primitive boat launch is provided by WDFW and is considered part of the Tapteal Greenway Water Trail. A neighborhood park is located along Glen Briar Lane (shown as undeveloped; Richland 2012). An existing soft surface trail in W.E. Johnson Park extends along the shoreline in this reach.</p>	
<p>Existing Public Access Goals:</p> <p>See Reach 1 regarding the City’s overall goal to develop and implement a regional open space plan. The Tapteal Greenway Plan and Ridges to Rivers Vision Plan identify a desire to “[e]stablish a connective trail between W.E. Johnson Park and Horn Rapids County Park” to the north, which also captures Reaches 1 and 2. This same concept is included in the City’s Final Parks, Trails and Open Space Master Plan (2012).</p>	
<p>Identified Public Access Improvements:</p> <p>SR A: None</p> <p>SR B: The City has adopted a master plan for W.E. Johnson Park (City of Richland 2011 and 2012)</p> <p>SR C: None</p>	
CUMULATIVE IMPACT CONSIDERATIONS	
<p>Watershed level: The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts, and upriver degradation of water quality conditions. Richland’s focus should be on preventing further degradation of Lower Yakima conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Water quality impacts from herbicide and fertilizer run-off • Impacts from recreation use along the shoreline • Other impacts from non-native predation (domestic pets, smallmouth bass, and pike) • Impervious surfaces leading to habitat loss and potential runoff • Vegetation alterations removing organic material and increasing soil erosion • Structural effects on habitat through road fragmentation and development within the uplands 	

References:

City of Richland. WE Johnson Final Master Plan-Option A.

Available: <http://richlandparksandrec.com/DocumentCenter/Home/View/173>. Accessed.

RICHLAND		CITY OF RICHLAND
REACH 4	Reach Length: 4.89 mile	
Shoreline Jurisdiction: 1737.52 acres (approx.)		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends about 3 miles along the river south of the I-182 bridge over the Yakima River extending to the I-182 bridge over the Columbia River and is floodplain under U.S. Army Corps of Engineers jurisdiction and adjacent uplands managed by the City of Richland.</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Extends approximately 2 miles from the I-182 bridge to the SR 240 bridge</p> <p>SR B: Extends approximately 2.3 miles from the SR 240 bridge to about 700 feet east of the Columbia River confluence</p> <p>SR C: Extends approximately 2,300 feet around the point at the confluence of the Yakima and Columbia rivers</p>		
PHYSICAL CHARACTERISTICS		
Ownership: U.S. Army Corps of Engineers leased to the City of Richland		

RICHLAND	CITY OF RICHLAND
<p>Existing Land Cover/Development: Open space, Industrial development (gravel mining) mostly outside of the shoreline jurisdiction</p>	
<p>Land Use/Current SMP: Current SMP Environment Designation: Conservancy Current Zoning: Natural open space Current Land Use: Natural open space, developed open space, industrial, and public facility (SR 4C) Water-dependent Uses: None Water-related Uses: Trails in the area provide for water enjoyment Non-water-related Uses: Open space Future Land Use: No change from open space use is projected.</p>	
<p>Major Infrastructure: Public water access, public water system, informal trails along the shoreline, SR 240 and crossing, and I-182 and crossing.</p>	
<p>Geomorphic Character: Reach 4 extends along the Yakima River (left bank) from the I-182 bridge downstream to its confluence with the Columbia River. Reach 4 also includes a small segment of the Columbia River (right bank) upstream of the confluence with the Yakima River. The river is a low-gradient, single-thread channel throughout the reach. The river channel generally widens downstream through the reach. Deposits of alluvial sediments have created island features. Soils are all alluvial silt loams. This reach is moderately constrained by roads; however, historically this is an actively moving channel. Hardened banks: Armoring includes abutments for the I-182 and Highway 240 bridges.</p>	
<p>Flooding and Geological Hazards: Small parts of this reach are mapped in the FEMA High Risk Flood Areas, and it supports freshwater forested/shrub wetlands. Flooding risks in this area are moderate because of active historical channel movement and expansive OHWM area.</p>	
<p>Channel Migration Zone: Reach 4 is located along the left bank of the Yakima River and includes a small segment of the Columbia River. Infrastructure influencing the location of the CMZ includes the I-182 bridge crossing at the upstream extent and a railroad and the Hwy 240 bridge crossings. A levee is located in the left bank floodplain downstream of the I-182 Bridge (extending downstream to Hwy 240) and protects the area of the City of Richland Waste Water Treatment Plant. Along the upstream extent of this reach, the CMZ generally follows an off-set of this levee alignment through the floodplain. The CMZ does not extend back to the levee alignment because of the distance from the channel. Downstream of Hwy 240 bridge, the CMZ widens in the broad flat floodplain at the mouth of the Columbia River. There are no limiting infrastructure features to limit channel migration. Per Ecology, a CMZ delineation is not necessary for the Columbia River.</p>	
<p>REACH CHARACTERIZATION AND ANALYSIS</p>	
<p>Water Quantity and Sediment: Water quantity is influenced by releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow; and from the Columbia River McNary Pool, with water extending upstream near the I-182 bridge, as this reach includes the Yakima River delta. The major surface water inputs in this reach include the City's wastewater treatment plant discharge. Badger Mountain</p>	

RICHLAND	CITY OF RICHLAND
Irrigation District also diverts water in this reach for agriculture and landscape irrigation purposes.	
<p>Water Quality: There are water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from 4A in 2005 because the Lower Yakima pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). Additionally, WWTP discharges in this reach may impact water quality for a short time downstream until it completely mixes with the Yakima River and Columbia River.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p>	
No threatened or endangered terrestrial species present in the immediate vicinity.	
The water area of the Yakima River supports migratory waterfowl as a resting and feeding area. Some nesting may occur.	
<p>SR A: This subreach includes the 276-acre Chamna Natural Preserve managed by the Tapteal Greenway Association. It is part of the Yakima River delta and is managed in conjunction with other lands owned by the USACE as a Nature Preserve with limited non-motorized access. Habitat includes about 100 acres of upland, including 50 acres of abandoned farm fields. Floodway and riparian areas are dominated by invasive Russian Olive with a mixture of native and non-native trees and shrubs including Cottonwood, Alder, Red Osier Dogwood, and a variety of Willow species (CWG 2006). The downstream 1,000 feet closest to the SR 240 bridge is the site of a former gravel mine and has more limited riparian habitat than upstream areas.</p>	
<p>This area primarily provides productive floodplain and wetland habitat for reptiles, amphibians, and small mammals with lifecycle stages dependent on water. The prevalence of invasive species limits habitat productivity. The small area of upland shrub/steppe habitat limits the range of species and populations. The area likely functions as available habitat for mobile species that can move between small habitat areas rather than supporting a resident population. The availability of the area to larger mammals, such as mule deer is dependent upon preservation of migration routes, which are constrained both upriver and across adjacent urbanized uplands.</p>	
<p>This area presents few limitations for movement corridors for both aquatic and terrestrial species. The level of human activity provided by trail systems through the area likely retards animal movement during periods of high human use.</p>	
<p>SR B: This subreach includes the portion of the Yakima River delta downstream of SR 240 and is managed in conjunction with other lands owned by the USACE as a Nature Preserve with limited non-motorized access. Habitat includes productive floodplain and wetland habitat for reptiles, amphibians, and small mammals with lifecycle stages dependent on water. The area has effective connections with other portions of the delta upstream and to the south and provides a range of functions for a variety of mobile species that can move between various habitat areas. The dense urban development along the shoreline to the north precludes movement of terrestrial species other than by flight or swimming.</p>	
<p>The upland shrub/steppe habitat in the Columbia Point area above the adjacent steep slope is isolated by the I-182 freeway to the north and is substantially degraded by past agricultural and off-road use, which further reduces the low productivity of such habitat limits the range of species and populations. The availability of the</p>	

RICHLAND	CITY OF RICHLAND
<p>area to larger mammals, such as mule deer, is dependent on preservation of regional migration routes.</p>	
<p>SR C: This subreach includes about 800 feet of the Yakima River delta upstream of I-182 and consists of a steep bank that rises from the water's edge with a very narrow margin of riparian vegetation. Riparian habitat value is very limited for some species but valuable for some bird species.</p>	
<p>The National Wetland Inventory (NWI) shows patches of riparian wetlands in most of SR A and SR B, as the shoreline nears the Yakima Delta. SR C has no wetlands. The immediate shorelines in SR A and most of SR B are natural, but the river's course is confined due to the City's presence. SR C is confined due to the proximity of Highway 12.</p>	
<p>Several fish species populate the Lower Yakima River in this reach. Salmonid fish include steelhead and spring and fall Chinook salmon. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima Basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern pikeminnow, sculpin, mountain whitefish, white sturgeon, catfish, sucker, walleye, rainbow trout, chiselmouth, dace, common carp, and various minnow species.</p>	
<p>Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
SUBREACH A	
<p>Level of Existing Function: Functioning</p>	
<p>Stressors: Bridges limit channel migration and control patterns of sediment deposition, industrial uses (gravel mine and wastewater treatment plant), backwater effect from McNary dam, wastewater treatment discharge from outfall, recreation uses</p>	
<p>Potential Restoration Opportunities: Consider opportunity to buffer from adjacent industrial land (near SR-240 bridge) use or reclaim areas of gravel mine for off channel rearing habitat</p>	
<p>Potential Protection Opportunities: Protect riparian and wetland vegetation in low-lying floodplain areas</p>	
Preliminary Shoreline Environment Designation Considerations:	
<p>Parallel Conservancy and Recreation (100' from OHWM/Industrial inland)</p>	
SUBREACH B	
<p>Level of Existing Function: Functioning</p>	
<p>Stressors: Backwater effect from McNary dam, bridge crossings limit channel migration and McNary pool controls sediment deposition, water quality concerns related to past agriculture practices, recreation use.</p>	
<p>Potential Restoration Opportunities: Adjacent to SR 240; revegetation of riparian areas</p>	
<p>Potential Protection Opportunities: Shrub-steppe protection consistent with WDFW guidelines, limit public access to designated trails</p>	

RICHLAND	CITY OF RICHLAND
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Conservancy below slope and Recreation above slope</p>	
<p>SUBREACH C</p>	
<p>Level of Existing Function: Functioning, partially functioning, impaired</p> <p>Stressors: Limited riparian vegetation due natural conditions, degraded shrub-steppe from roads and trails and recreation use</p> <p>Potential Restoration Opportunities: Riparian and shrub steppe vegetation restoration as part of future development or management decisions</p> <p>Potential Protection Opportunities: Prevent further degradation to shrub steppe and riparian areas</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Natural below slope, Mixed Use above slope</p>	
<p>PUBLIC ACCESS</p>	
<p>Existing Public Access:</p> <p>SR A: As noted in the habitat discussion above, this reach includes the 276-acre Chamna Natural Preserve. The City’s Final parks plan (City of Richland 2012) indicates that the area is owned by the U.S., managed by the U.S. Army Corps of Engineers, and leased to the City of Richland. Chamna has two land use designations: 262 acres of natural open space and 32 acres of developed open space. About 11 miles of trails are found throughout the preserve. The Tapteal Greenway Association maintains trails (Tapteal Greenway Association 2012). The preserve is part of the Yakima River delta and is managed in conjunction with other lands owned by the Corps as a nature preserve with limited non-motorized access.</p> <p>SR B: As described above, this reach includes the portion of the Yakima River delta downstream of SR 240 and is managed in conjunction with other lands owned by the Corps as a nature preserve with limited non-motorized access. City inventories show a portion of the land as part of the Columbia Point Environment. A primitive boat launch is mapped (City of Richland 2012).</p> <p>SR C: The City identifies this reach as part of the Columbia Point Environment. The Tapteal Greenway Association (2012) notes this area has “controlled access for muscle-powered recreation.”</p>	
<p>Existing Public Access Goals:</p> <p>The City’s Comprehensive Plan Capital Facilities Element includes a stewardship goal:</p> <ul style="list-style-type: none"> • Protect and provide responsible stewardship of the community's unique natural habitat and ecologically sensitive and scenic waterfront areas; develop public recreational activities appropriate to these venues 	

RICHLAND	CITY OF RICHLAND
<p>Identified Public Access Improvements:</p> <p>SR A: Richland’s Comprehensive Plan (2008) includes several objectives in the Parks and Recreation element, including:</p> <ul style="list-style-type: none"> • Complete the Chamna Natural Preserve ADA Loop Trail • Construct restroom facilities at all community parks, larger neighborhood parks, and the Chamna Natural Preserve <p>The City’s Final Parks, Trails and Open Space Master Plan (2012) identifies the following action:</p> <ul style="list-style-type: none"> • Establish trails connecting Amon Creek Natural Preserve with Little Badger Mountain and the Chamna Natural Preserve 	
<p>CUMULATIVE IMPACT CONSIDERATIONS</p>	
<p>Watershed level: The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts, and upriver degradation of water quality conditions. Richland’s focus should be on preventing further degradation of Lower Yakima conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Impacts from recreation use and recreation development along the shoreline • Water quality impacts from impervious surface runoff from transportation facilities • Potential for vegetation alterations from existing and future development • Other impacts from non-native predation (domestic pets, smallmouth bass, and pike minnow) 	

RICHLAND		CITY OF RICHLAND
REACH 5	Reach Length: 1.58 mile	
Shoreline Jurisdiction: 192.02 acres		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends about 8,300 feet along the right bank of the Yakima River from the City Limits at Northlake Drive to the I-182 Yakima River bridge.</p>		
PHYSICAL CHARACTERISTICS		
<p>Ownership: U.S. Army Corps of Engineers</p>		
<p>Existing Land Cover/Development: Open space with no significant development other than the I-182 crossing and the Columbia Irrigation District canal.</p>		
<p>Land Use/Current SMP:</p> <p>Current SMP Environment Designation: Conservancy Current Zoning: Natural open space (east of Columbia Canal) Adjacent Zoning: Natural open space</p> <ul style="list-style-type: none"> • Limited business (adjacent to City View Drive, west of Columbia Canal) • Medium-density residential small lot (adjacent to Ridgecliff Drive, west of Columbia Canal) <p>Current Land Use Land Use: Natural open space (east of Columbia Canal)</p> <ul style="list-style-type: none"> • Agriculture (west of Columbia Canal) • Vacant commercial (west of Columbia Canal) • Single-family residential (west of Columbia Canal) <p>Water-dependent Uses: None Water-related Uses: None Non-water-related Uses: Agriculture, commercial, single-family residential</p>		

RICHLAND	CITY OF RICHLAND
<p>Future Land Use: No change from the current pattern of use is projected for commercial and residential areas, although vacant commercial areas are likely to develop in the future.</p> <p>Existing open space use is not likely to change in the future consistent with the comprehensive plan designation of the area as urban reserve, which provides that these lands that are to be held in reserve during the 20-year planning period of the comprehensive plan.</p> <p>There is no potential for water-oriented use on private upland parcels due to the intervening open space.</p>	
<p>Major Infrastructure: Public water access, public water system, Informal trails along the shoreline, Columbia Canal irrigation channel, transmission lines over river</p>	
<p>Geomorphic Character: Reach 5 is located on the west bank (right bank) of Yakima River upstream of the I-182 bridge. This reach is characterized as a meandering, mostly single-thread channel that is moderately stable, with slight channel migration since 1956 (based on aerial photo interpretation). The geologic units along the reach corridor consist of alluvium, flood deposits, and, to a lesser extent, basalt bedrock and sedimentary rocks. The channel is partially confined against the right bank valley wall. The right bank valley wall rises steeply at its margins. An irrigation canal is located along the channel margins. Throughout much of this reach, soils consist mostly of loamy fine sand. This reach primarily supports freshwater forested/shrub wetlands—wetland acreage increases as this reach nears the confluence of the Columbia and Yakima rivers.</p> <p>Hardened banks: No significant armoring was noted during inspection of aerial photography.</p>	
<p>Flooding and Geological Hazards: Approximately 25% of this reach is mapped within the FEMA High Risk Flood Area. Geologic hazards are primarily a low risk of flooding as evidenced by historical channel movement.</p>	
<p>Channel Migration Zone: Reach 5 is located along the right bank of the Yakima River upstream of the I-182 bridge. The CMZ is mostly defined by the presence of infrastructure. An irrigation canal located along the left bank limits the CMZ throughout most of this reach. The distance of the alignment of the irrigation canal to the Yakima River increases downstream. A bedrock outcrop is located along the left bank also limits migration. Upstream of this bedrock outcrop, where the canal is aligned closer to the channel, the CMZ follows this canal. Downstream, the CMZ widens where the canal is offset back from the river a greater distance. In the area immediately upstream of the I-182 bridge, the floodplain is wider, allowing for more channel migration through the alluvium and sand dominated soils.</p>	
<p>REACH CHARACTERIZATION AND ANALYSIS</p>	
<p>Water Quantity and Sediment: Water quantity is influenced by releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow.</p>	
<p>Water Quality: There are water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from 4A in 2005 because the Lower Yakima Pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). Water quality is not likely to be impacted by local sources in this reach.</p>	

RICHLAND	CITY OF RICHLAND
Habitat Characteristics and PHS Species Presence:	
<p>No threatened or endangered terrestrial species present in the immediate vicinity.</p>	
<p>The water area of the Yakima River supports migratory waterfowl as a resting and feeding area. Some nesting may occur.</p>	
<p>This floodplain within this area is part of the Yakima River delta and is managed in conjunction with other lands owned by the USACE as a Nature Preserve with limited non-motorized access. The initial 1,000 feet of this area is a floodplain separated by a slough from the steep bank defining the adjacent areas. This area primarily provides productive floodplain and wetland habitat for reptiles, amphibians and small mammals with lifecycle stages dependent on water. Floodway and riparian areas are characterized by both native and invasive species. The relative lack of ongoing human disturbance provides for a vegetation community supporting a range of species. The small area, however, limits the range and number of species.</p>	
<p>Upland shrub/steppe habitat has been altered in the past and provides a limited area of habitat for a variety of species.</p>	
<p>The 1,500 linear feet of residential development along View Drive is bounded by steep slopes and has relatively low habitat value due both to a narrow area of riparian vegetation and proximity impacts from noise.</p>	
<p>This area presents few limitations for movement corridors for both aquatic and terrestrial species. Movement upstream is largely dependent on the floodway areas on the opposite side of the river due to urban development on the left bank adjacent to the river. The Columbia Canal provides a barrier for human activity. Proximity impacts such as noise, light, and glare from adjacent urban use likely limit productivity of adjacent areas.</p>	
<p>The National Wetland Inventory (NWI) shows patches of riparian wetlands present in this reach, especially along the immediate shoreline. Shorelines are natural but are confined by the irrigation canal and the Highway 182 corridor.</p>	
<p>Several fish species populate the Lower Yakima River in this reach. Salmonid fish include steelhead and spring and fall Chinook salmon. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern pikeminnow, sculpin, mountain whitefish, white sturgeon, catfish, sucker, walleye, rainbow trout, chiselmouth, dace, common carp, and various minnow species.</p>	
<p>Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the Lower Yakima River. Fish passage is impeded regionally by the presence of several dams.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
<p>Level of Existing Function: Functioning</p>	
<p>Stressors: Irrigation canal with access road, some shoreline access points, McNary pool effects, transmission lines, little channel migration potential, slumping of steep slope</p>	

RICHLAND	CITY OF RICHLAND
<p>Potential Restoration Opportunities: Restore vegetation on shoreline slope near irrigation canal</p> <p>Potential Protection Opportunities: Protect existing low lying, riparian and shrub-steppe habitat</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Parallel Natural below CID canal, Residential above canal where in SMA jurisdiction.</p>	
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>Reach 5 is designated as natural open space in the City's Comprehensive Plan (City of Richland 2008), though not mapped in the Final parks plan with a particular facility name. A soft surface trail exists along this reach (City of Richland 2012).</p>	
<p>Existing Public Access Goals:</p> <p>See general City goals regarding a connected open space plan described in Reach 1 and stewardship of sensitive areas and public recreation in Reach 4.</p>	
<p>Identified Public Access Improvements:</p> <p>None</p>	
CUMULATIVE IMPACT CONSIDERATIONS	
<p>Watershed level: The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts, and upriver degradation of water quality conditions. Richland's focus should be on preventing further degradation of Lower Yakima conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Water quality impacts from herbicide and fertilizer run-off into agriculture canals • Impacts from recreation use along the shoreline • Other impacts from non-native predation (domestic pets, smallmouth bass, and pike) 	

RICHLAND		CITY OF RICHLAND
REACH 6	Reach Length: 5.07 mile	
Shoreline Jurisdiction: 392.84 acres		
		
Source: https://www.bing.com/maps/		
<p>Description: The shoreline within this reach extends along the right bank of the Yakima River from the I-182 Yakima River bridge through the SR 240 bridge and to the eastern city limits, including Bateman and other smaller islands</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Extends approximately 2.7 miles from the I-182 bridge to the 240 bridge</p> <p>SR B: Extends approximately 0.2 miles across the SR 240 bridge</p> <p>SR C: Extends approximately 1.5 miles to the east of the SR 240 bridge</p>		
PHYSICAL CHARACTERISTICS		
<p>Ownership: Reach 6 is federally owned by the U.S. Army Corps of Engineers with some areas leased to the City; some private ownership in SR 6C.</p>		
<p>Existing Land Cover/Development:</p> <p>SRs A and B: Public lands and open space with no significant development other than the I-182 crossing.</p> <p>SR C: Public open space directly neighboring medium to high density commercial, residential, waterfront, and research park developments to the south</p>		
<p>Land Use/Current SMP:</p> <p>SR A:</p> <p>Current SMP Environment Designation: Conservancy</p> <p>Current Zoning: Natural open space (floodplain area)</p> <p>Adjacent Zoning: Benton County – Residential</p> <p style="padding-left: 40px;">City of Richland: Single-family residential</p> <p>Current Land Use: Natural open space (east of residential area on View Drive, east of Columbia Canal)</p> <p style="padding-left: 40px;">Single-family residential (along View Drive and east of Columbia Canal)</p> <p>Water-dependent Uses: None</p>		

RICHLAND	CITY OF RICHLAND
<p>Water-related Uses: None</p> <p>Non-water related Uses: Single-family residential</p> <p>Future Land Use: No change from the current pattern of use is projected for residential areas</p> <p>There is no potential for water-oriented use on private upland parcels due to the intervening open space. Non-motorized recreation use will continue on open space lands.</p> <p>SR B:</p> <p>Current SMP Environment Designation: Conservancy, except for islands, which are Natural</p> <p>Current Zoning: Natural open space (floodplain area)</p> <p>Adjacent Zoning: Benton County – Residential City of Richland: Single-family residential</p> <p>Current Land Use: Natural open space (east of residential area on View Drive, east of Columbia Canal) Single-family residential (along View Drive and east of Columbia Canal)</p> <p>Water-dependent Uses: None Water-related Uses: None</p> <p>Non-water related Uses: Single-family residential</p> <p>Future Land Use: No change from the current pattern of use is projected for residential areas</p> <p>There is no potential for water-oriented use on private upland parcels due to the intervening open space. Non-motorized recreation use will continue on open space lands.</p> <p>SR C</p> <p>Current SMP Environment Designation: Urban, except for Bateman Island, which is Conservancy</p> <p>Current Zoning: Natural open space (floodplain area)</p> <p>Adjacent Zoning: Natural Open Space Commercial & Waterfront</p> <p>Current Land Use: Public open space Single-family residential (south of Columbia Canal) Vacant commercial (south of Columbia Canal)</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: Parks provide opportunities for water enjoyment Non-water related Uses: All existing uses except park</p> <p>Future Land Use: There is little potential for water-oriented use on private upland parcels</p>	
<p>Major Infrastructure: Public water access, public water system, informal trails along the shoreline, Columbia Canal irrigation channel, Columbia Park Trail, Wye Park, Connection to the Bateman Island, Columbia Park West</p>	

RICHLAND	CITY OF RICHLAND
<p>Geomorphic Character: Reach 6 extends along the south bank (right bank) to the confluence of the Yakima River with the Columbia River. The channel is low gradient and generally widens towards the confluence with the Columbia River. The Highway 240 crossing is located near the confluence with the Columbia River. This meandering channel is confined by roads to a greater extent than Reach 4, but still shows historical channel movement (in comparison to the 1954 aerial photographs). Geologic features are mostly flood and alluvial deposits with soils consisting of loamy fine sand and a small region confined by basalt bedrock.</p> <p>Hardened banks: Raised bank along the river on the east of SR 240 crossing, armoring in Columbia Point Marina Park and along some portion of Columbia Park Trail.</p>	
<p>Flooding and Geological Hazards: Small parts of this reach are mapped in the FEMA High Risk Flood Areas, and it contains mostly freshwater forested/shrub wetlands—wetlands increase as this reach nears the confluence of the Columbia and Yakima rivers. Flooding risks in this area are moderate because of active historical channel movement and expansive OHWM area. The geologic features of flood deposits show that this area has a history of flooding.</p>	
<p>Channel Migration Zone: Reach 6 is located along the right bank of the Yakima River and extends from the I-182 Bridge to the Columbia River. Infrastructure defining the location of the CMZ includes the I-182 bridge crossing at the upstream extent and a railroad and SR 240 bridge crossings. In the upstream extent, the CMZ follows the high, steep bank. Downstream of the high bank, the floodplain widens and the CMZ follows the setback along Columbia River Trail to the railroad and SR 240 bridge crossings. Downstream of SR 240, the CMZ follows a setback levee along the right bank. Downstream of the levee, the CMZ widens as the floodplain widens at the mouth of the Columbia River.</p>	
REACH CHARACTERIZATION AND ANALYSIS	
<p>Water Quantity and Sediment: Water quantity is influenced by releases from Yakima Project reservoirs, irrigation diversions, and irrigation return flow; and from the Columbia River McNary Pool, as this reach includes the Yakima River delta. The major surface water inputs in this reach include the City’s wastewater treatment plant discharge. Badger Mountain Irrigation District also diverts water in this reach for agriculture and landscape irrigation purposes.</p>	
<p>Water Quality: There are water quality listings for Dieldrin, dissolved oxygen, pH, DDT, endosulfan, and temperature. Ecology remarks that the reach returned to Category 5 from 4A in 2005 because the Lower Yakima pesticides total maximum daily load (TMDL) targets are for chronic aquatic life criteria and not the more stringent human health criteria (Ecology 2008). Additionally, WWTP discharges in this reach may impact water quality for a short time downstream until it completely mixes with the Yakima River and Columbia River. Nearby impervious surfaces from roads, residential roofs, and industrial activities may contribute stormwater runoff in SR C.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Yakima River supports migratory waterfowl as a resting and feeding area. Some nesting may occur.</p>	

RICHLAND**CITY OF RICHLAND**

SR A: A range of opportunities are provided along the shoreline for species with lifecycle stages related to water in extensive floodplains area. Portions of the floodplain are likely to be particularly productive because of a slough separating a large part of the floodplain from the bank. The upstream portion consists of an island separated from the bank by a slough. This slough, together with a steep bank and the canal reduces human disturbance in the upstream 1,000 feet of the corridor. This area primarily provides productive floodplain and wetland habitat for small resident species of reptiles, amphibians, and small mammals, particularly those with lifecycle stages dependent on water.

Adjacent to the residential area for about 1,500 feet along View Drive, the riparian area narrows due to the steep bank with corresponding reduction in habitat value, which is further reduced by proximity impacts such as noise and light and likely predation by domestic animals.

The portion adjacent to the Columbia Canal, a distance of about 4,000 feet, features a steep bank between the water's edge and the canal that provides a very narrow band of riparian vegetation and limited potential for wildlife movement.

SR B: This subreach includes the Riverview Preserve, a 268-acre floodplain area extending about 6,500 feet along the river that is maintained by the Corps of Engineers. This is part of the larger Yakima Delta, but is isolated by a railroad and the SR 240 corridor. An existing tunnel under SR 240 provides a wildlife movement corridor.

This extent to which this area functions as part of the larger delta is dependent on movement corridors both upstream and downstream. Movement downstream is largely constrained by the existing Yakima River bridge. The level of human activity from trail systems through the area is relatively limited. However, proximity impacts from highways on the margin of the area produces substantial proximity impacts such as noise and light and likely limits areas near these facilities to less sensitive species. Mortality for animals attempting to cross the highway may be substantial along SR 240.

SR C: This subreach includes the Yakima Delta stretching from SR 240 to the city limits. The margins of the shoreline include about 4,500 feet of levee, and high bank steep slope. This reach includes the 160-acre Bateman Island and several hundred acres of delta deposits. The land uses along the shoreline provide little habitat value, although parts provide cover, understory and food sources for songbirds, shorebirds and small mammals. The delta area as a whole provides a wide variety of riparian/wetland and upland vegetation in a large contiguous area with limited human disturbance and has the potential for providing a range of lifecycle functions for a wide range of species.

The National Wetland Inventory (NWI) shows patches of riparian wetlands in the eastern half of SR A and western half of SR B, as the shoreline becomes the Yakima Delta. The shoreline of SR C is developed and hardened, with roads adjacent to the shore. Patches of wetlands occur on the islands and outcroppings of the Yakima Delta. The confluence area wetland habitats are important staging and acclimatization zones for migrating salmonids. Several fish species populate the lower Yakima River in this reach. Salmonid fish include steelhead and spring and fall Chinook salmon. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the Yakima Basin. Bull trout were historically present and abundant in upper tributaries of the Yakima Basin and may now occur in this reach in low numbers. Lamprey are present but have experienced population decline in recent years. Resident fish include small- and largemouth bass, northern chiselmouth, dace, common carp, and various minnow species.

RICHLAND	CITY OF RICHLAND
<p>Limitations to aquatic habitat in this reach are the elevated water temperatures and low flow common to the lower Yakima River. Fish passage is impeded regionally by the presence of several dams.</p>	
<p>ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)</p>	
<p>SUBREACH A</p>	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Irrigation canal with access road, McNary pool effects</p> <p>Potential Restoration Opportunities: Evaluate vegetation on shoreline slope near irrigation canal, evaluate potential to further restore Yakima River delta natural processes currently constrained by SR 240</p> <p>Potential Protection Opportunities: Protect existing low lying, riparian and shrub steppe habitat</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Natural</p>	
<p>SUBREACH B</p>	
<p>Level of Existing Function: Functioning</p> <p>Stressors: SR 240, McNary pool, recreation use</p> <p>Potential Restoration Opportunities: Remove invasive species and restore with native vegetation</p> <p>Potential Protection Opportunities: Manage recreation activities to maintain function</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Conservancy</p>	
<p>SUBREACH C</p>	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Trail, hardened shoreline along levee, over-water structures at marina, and irrigated lawn area at parks, parking, boat launch</p> <p>Potential Restoration Opportunities: Evaluate potential benefits from breaching portions of causeway, emphasize shoreline public access, and demonstrate appropriate native landscaping as part of Columbia Park West Master Plan and Hanford Reach Interpretive Center development. Remove invasive species and restore with native vegetation on Bateman Island and other applicable areas.</p> <p>Potential Protection Opportunities: BMPs for irrigated landscaping within developed parks</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Natural waterward of levee/steep slope, Waterward landward of levee/Road, small area of Recreation</p>	

RICHLAND	CITY OF RICHLAND
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>This area includes (City of Richland 2012):</p> <ul style="list-style-type: none"> • Portions of the Riverview Natural Preserve and Columbia Park Trail (SRs A and B) • Bateman Island Natural Open Space (SR C) • Wye Neighborhood Park (SR C) • Columbia Park Trail and Columbia Park West (SR C) with boat launches, docks, water moorage facilities, trails, picnic facilities, and others 	
<p>Existing Public Access Goals:</p> <p>See general City goal regarding a connected open space plan described in Reach 1 and stewardship of sensitive areas and public recreation in Reach 4.</p>	
<p>Identified Public Access Improvements:</p> <p>A Master Plan was adopted in 2010 for Columbia Park West.</p>	
CUMULATIVE IMPACT CONSIDERATIONS	
<p>Watershed level: The SMP has limited influence on Yakima River operations by the U.S. Bureau of Reclamation and irrigation districts, and associated upriver degradation of water quality conditions; and on U.S. Army Corps of Engineers McNary Dam operations. Richland’s focus should be on preventing further degradation of Lower Yakima and Columbia River conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Impacts from recreation use and recreation development along the shoreline • Water quality impacts from impervious surface runoff from transportation facilities • Other impacts from non-native predation (domestic pets, smallmouth bass, and pike minnow) 	

RICHLAND		CITY OF RICHLAND
REACH 7	Reach Length: 2.51 mile (excluding islands)	
Shoreline Jurisdiction: 79.60 acres (excluding islands)		
		
Source: https://fortress.wa.gov/ecy/coastalAtlas/UICoastalAtlas/Tools/ShorePhotos.aspx		
<p>Description: The shoreline within this reach extends about 8,000 feet along the right bank of the Columbia River from the north Urban Growth Area boundary to the City limits at Horn Rapids Road. The reach includes largely U.S. Department of Energy (DOE) land and includes portions of Wooded Island, Susan Island, and Barb Island in the Columbia River.</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Extends approximately 0.8 miles from the UGA Boundary</p> <p>SR B: Extends approximately 0.7 miles just east of Apple Street</p> <p>SR C: Extends approximately 0.8 miles to the southern extent of the UGA Boundary</p> <p>SR D: Includes the islands</p>		
PHYSICAL CHARACTERISTICS		
Ownership: City of Richland		
Existing Land Cover/Development: Open space		
<p>Land Use:</p> <p><i>SRs A through C:</i></p> <p>Current SMP Environment Designation: Urban</p> <p>Current Zoning: Zoning not established for this area</p> <p>Current Land Use Land Use: Vacant (DOE)</p>		

RICHLAND	CITY OF RICHLAND
<p>Water-dependent Uses: None</p> <p>Water-related Uses: None</p> <p>Non-water related Uses: Federal research and development laboratory</p> <p>Future Land Use: No change from the current pattern of use is projected in the near future</p> <p>The Richland Comprehensive Plan designates the area for a mix of developed and natural open space, commercial, residential, business research park and industrial</p> <p>There is potential for a variety of water-oriented use if this area is made available for non-federal use</p> <p><i>SRs D through F—Columbia River Islands:</i></p> <p>Current SMP Environment Designation: Natural</p> <p>Current Zoning: Natural open space (floodplain area)</p> <p>Adjacent Zoning:</p> <p>Current Land Use: Open space – National Wildlife Refuge Water-dependent Uses: None</p> <p>Water-related Uses: None Non-water related Uses: None</p> <p>Future Land Use: Federal Wildlife Refuge open space.</p>	
<p>Major Infrastructure: Railroad nearby.</p>	
<p>Geomorphic Character: Reach 7 includes the east bank (right bank) and associated bars along the Columbia River (upstream of the City of Richland limits). In this reach, the Columbia River is a straight, incised, single-thread channel. The geologic units are primarily flood deposits on the east bank while alluvial deposits make up the mid-channel unvegetated bars. The soils along the shoreline are made up of loamy sand and fine sandy loam.</p> <p>Hardened banks: No significant armoring was noted during inspection of aerial photography.</p>	
<p>Flooding and Geological Hazards: The mid- to channel islands are mapped in FEMA High Risk Flood Areas, but the bank is stable and unlikely to be susceptible to flood risks in its current form.</p>	
<p>Channel Migration Zone: Per Ecology, a CMZ delineation is not necessary for the Columbia River.</p>	
<p>REACH CHARACTERIZATION AND ANALYSIS</p>	
<p>Water Quantity and Sediment: Water quantity is dependent on Columbia River (specifically Priest Rapids Dam) operations. There are no major surface water inputs or outputs in this reach.</p>	
<p>Water Quality: Impervious roads and buildings within the adjacent Hanford Nuclear Reservation may contribute stormwater runoff in SRs A, B, and C.</p>	

RICHLAND	CITY OF RICHLAND
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Columbia River supports migratory waterfowl as a resting and feeding area. Some nesting may occur. The Columbia River islands provide a breeding area for long billed curlew and a variety of gulls and a resting area with limited nesting for great blue heron and great egret.</p> <p>DOE land and the Hanford National Monument to the north provides an area of about 600 square miles relatively undisturbed habitat for upland species and about 45 miles or riparian habitat along the Columbia River. There are currently few barriers for wildlife movement between Reach 7 and this wildlife resource to the north.</p> <p>SRs A through D provide a limited range of habitat for species with lifecycle stages related to water due to the narrow band of riparian vegetation.</p> <p>SRs D through F include the Columbia River islands, which are part of the McNary National Wildlife Refuge and provide a variety of riparian and upland habitat. In addition, the area provides resting area for a variety for a variety of waterfowl including by mallards, Canada geese, and other waterfowl for wintering, and the island habitats for nesting for great blue herons, great egrets, black-crowned night-herons, double crested cormorants, and American white pelicans, as well as several species of gulls. The islands are isolated by water from most human disturbance but are subject to proximity impacts such as noise and light or glare.</p> <p>There are no wetlands in this reach. The shoreline is natural except for the area adjacent to the Department of Defense facility, where roads and parking areas encroach on the shore.</p> <p>Many fish species populate the Columbia River in this reach. Salmonid fish include Chinook (spring, summer, and fall), coho, chum (fall), pink, and sockeye salmon, as well as bull trout/Dolly Varden and steelhead and rainbow trout. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the nearby Yakima Basin. Lamprey are present but have experienced population decline in recent years. Other native fish species that can be found in the Columbia River near Richland include white sturgeon, bridgelip and mountain suckers, mottled sculpin, chiselmouth, redbelly dace, peamouth, northern pikeminnow. Invasive species include bluegill, bass, crappie, shad, carp, channel catfish, perch, and walleye.</p> <p>Shellfish in the Columbia River near Richland include the Columbia River limpet, the Columbia River spire snail, and the California floater.</p>	
<p>ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)</p>	
<p>SUBREACH A</p>	
<p>Level of Existing Function: Functioning</p> <p>Stressors: None</p> <p>Potential Restoration Opportunities: None</p> <p>Potential Protection Opportunities: Protect shrub steppe and riparian vegetation</p>	

RICHLAND	CITY OF RICHLAND
Preliminary Shoreline Environment Designation Considerations: Conservancy	
SUBREACH B	
Level of Existing Function: Partially functioning Stressors: Hanford 300 Area development and remedial activities, water intake or outfall structure just off of Riverview Loop Potential Restoration Opportunities: Reduce unnecessary impervious surface and re-vegetate with native species Potential Protection Opportunities: Protect shrub steppe and riparian vegetation	
Preliminary Shoreline Environment Designation Considerations: Conservancy	
SUBREACH C	
Level of Existing Function: Functioning Stressors: McNary pool effects (limited) Potential Restoration Opportunities: None Potential Protection Opportunities: Protect shrub steppe and riparian vegetation	
Preliminary Shoreline Environment Designation Considerations: Conservancy	
SUBREACH D	
Level of Existing Function: Functioning Stressors: McNary pool effects (limited) Potential Restoration Opportunities: None Potential Protection Opportunities: Protect shrub-steppe and riparian vegetation	
Preliminary Shoreline Environment Designation Considerations: Columbia River Islands Natural	
PUBLIC ACCESS	
Existing Public Access: None. About 55 acres are in federal ownership (Benton County 2012).	
Existing Public Access Goals: The Richland Comprehensive Plan includes a general objective to:	

RICHLAND	CITY OF RICHLAND
<ul style="list-style-type: none"> Provide public access and use of the Columbia River and Yakima River shoreline in a manner that accommodates various uses but limits their impact on the natural environment 	
Identified Public Access Improvements:	
None	
CUMULATIVE IMPACT CONSIDERATIONS	
Watershed level: The SMP has limited influence on the Columbia River, and upriver water quality conditions. Richland’s focus should be on preventing further degradation of Columbia River conditions.	
Reach level:	
<ul style="list-style-type: none"> Structural effects on habitat through informal road fragmentation within the uplands 	

RICHLAND		CITY OF RICHLAND
REACH 8	Reach Length: 2.07 mile (excluding islands)	
Shoreline Jurisdiction: 80.35 acres (excluding islands)		
 <p style="text-align: right; font-size: small;">©2007 Washington State Department of Ecology</p>		
Source: https://fortress.wa.gov/ecy/coastalatlantools/UICoastalAtlas/Tools/ShorePhotos.aspx		
<p>Description: The shoreline within this reach extends about 8,000 feet along the right bank of the Columbia River from the current City limits at Horn Rapids Road to Spring Road. The reach includes shoreline areas managed as part of the McNary Dam project and private and public uplands.</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Extends approximately 0.2 miles from the northern extent of the City limits to 11th Street</p> <p>SR B: Extends approximately 0.3 miles to Battelle Boulevard</p> <p>SR C: Extends approximately 0.7 miles to the WSU campus (east of University Drive)</p> <p>SR D: Extends approximately 0.3 miles to Sprout Street</p> <p>SR E: Extends approximately 0.6 miles to Spring Street</p> <p>SR F: Includes the island</p>		
PHYSICAL CHARACTERISTICS		
Ownership: U.S. Army Corps of Engineers, City of Richland, and private		
Existing Land Cover/Development: Vacant, public access trail, public institution and residential		

RICHLAND	CITY OF RICHLAND
<p>Land Use/Current SMP:</p> <p>Current SMP Environment Designation: Urban (SRs A – E) and Natural (island – SR F)</p> <p>SR A includes about 1,000 feet at the northern end of the reach.</p> <p>Current Zoning: Parks and public facilities and industrial</p> <p>Current Land Use: Developed open space and industrial</p> <p>Water-dependent Uses: Two barge unloading facilities</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Water-oriented development is likely in the near future.</p> <p>The Richland Comprehensive Plan designates the area as industrial to accommodate the continued use of the existing barging facilities while maintaining the current generally undeveloped condition of the shoreline area.</p> <p>SR B extends along about 1,800 feet of the shoreline with a recently approved multi-family development</p> <p>Current Zoning: Natural open space & Waterfront</p> <p>Adjacent Zoning: Business Research Park</p> <p>Current Land Use: Natural open space and residential development</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Maintenance of undeveloped shoreline in current condition is anticipated. Future development of upland areas with business research and business park uses is anticipated, along with the build out of the current residential development. Conservation easement in place on portion of shoreline adjacent to residential development.</p> <p>SR C extends along about 2,700 feet of the shoreline.</p> <p>Current Zoning: Waterfront, Natural Open Space, Parks & Public Facilities</p> <p>Adjacent Zoning: Business Research Park, Waterfront, & Parks & Public Facilities</p> <p>Current Land Use: Natural open space and undeveloped land</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Water-oriented development is likely in the near future.</p>	
Final Shoreline Inventory and Characterization Report	Jun 2014
Richland Shoreline Master Program Update	120849-01.01
2	

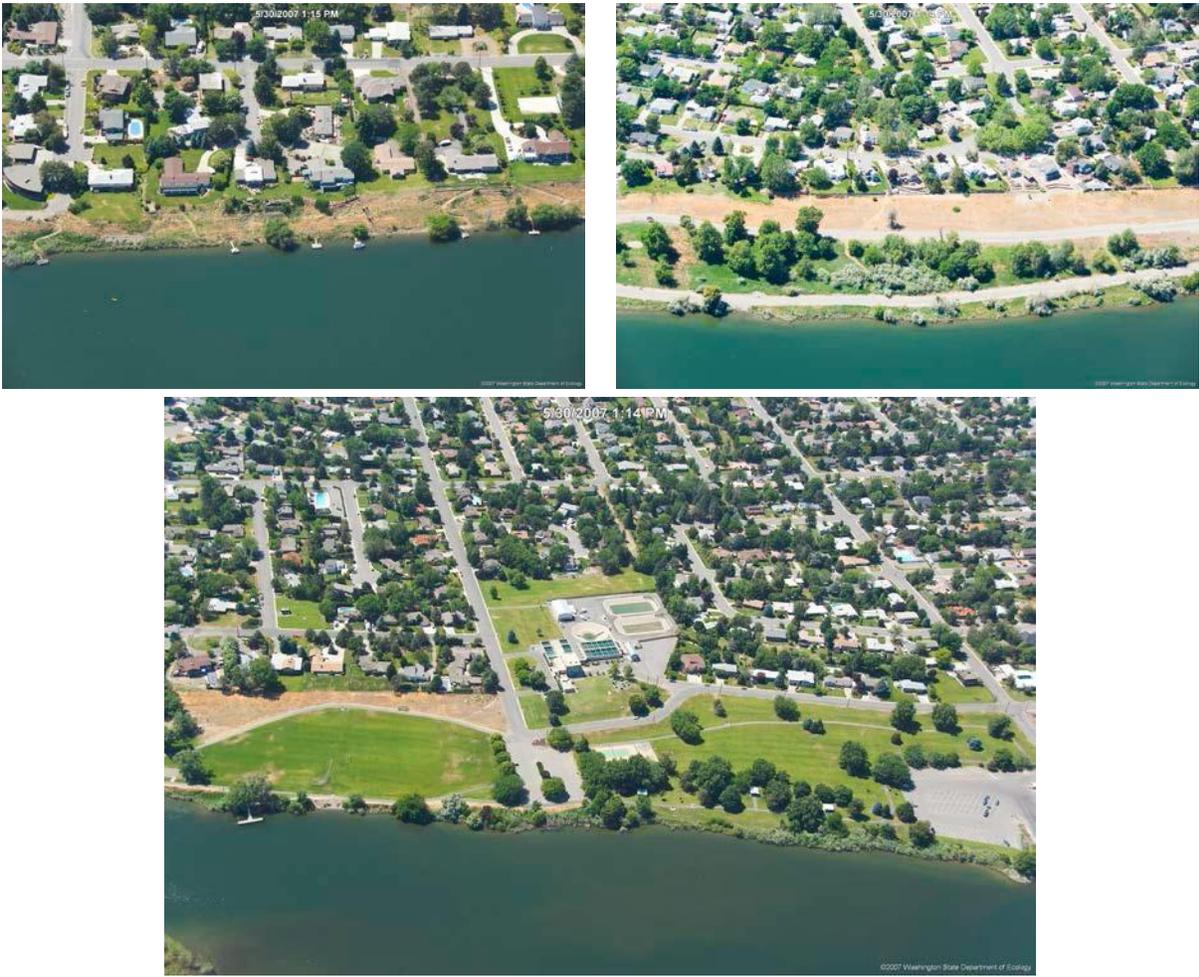
RICHLAND	CITY OF RICHLAND
<p>The Richland comprehensive plan designates the area as waterfront and provides for future development of a variety of water-oriented uses consistent with the City's vision and that incorporates public access recreational features and attractive and high quality development</p> <p>SR D extends along about 2,800 feet of the shoreline and consists of the WSU Tri-Cities Campus.</p> <p>Current Zoning: Parks & Public Facilities</p> <p>Adjacent Zoning: Parks & Public Facilities</p> <p>Current Land Use: Washington State University Tri-Cities Campus consisting of a variety of buildings and cultivated open space</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Further development of public facilities in adjacent upland locations associated with expansion of the WSU Tri-Cities Campus.</p> <p>SR E extends along about 1,800 feet of the shoreline.</p> <p>Current Zoning: Natural Open Space</p> <p>Adjacent Zoning: Single Family Residential</p> <p>Current Land Use: Single family residential neighborhood</p> <p>Water-related Uses: None</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Limited potential for further development.</p> <p>Water-oriented use is not likely, but water enjoyment opportunities likely will be provided.</p> <p>SR F includes a Columbia River island, which is part of the McNary National Wildlife Refuge and provides a variety of riparian and upland habitat.</p>	
<p>Major Infrastructure: Public water access, public water system, railroad, and Port of Benton nearby</p>	
<p>Geomorphic Character: Reach 8 includes the east bank (right bank) and a large mostly unvegetated island along the Columbia River downstream of the City of Richland boundary. This straight, incised, single-thread channel is confined by urban/agricultural infrastructure. The soils are primarily flood deposits on the east bank while alluvial deposits make up the mid channel island. The soils on the shoreline are made up of loamy sand and fine sandy loam.</p> <p>Hardened banks: Reminiscent water exhaust structures from the Hanford site; the water intake facility and barge landing, and a few docks near the residential area south of the WSU campus</p>	
<p>Flooding and Geological Hazards: The mid- to channel islands are mapped in FEMA High Risk Flood Areas, but the bank is stable and unlikely to be susceptible to flood risks in its current form.</p>	

RICHLAND	CITY OF RICHLAND
Channel Migration Zone: Per Ecology, a CMZ delineation is not necessary for the Columbia River.	
REACH CHARACTERIZATION AND ANALYSIS	
Water Quantity and Sediment: Water quantity is dependent on Columbia River (specifically Priest Rapids Dam) operations. There are no major surface water inputs or outputs in this reach.	
Water Quality: Nearby impervious surfaces from roads and residential roofs may contribute stormwater runoff in SRs A through E.	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Columbia River supports migratory waterfowl as a resting and feeding area. Some nesting may occur. The Columbia River islands also provide a breeding area for long billed curlew and a variety of gulls, as well as a resting area with limited nesting for great blue heron and great egret.</p> <p>SRs A through E provide a limited range of habitat for species with lifecycle stages related to water due to the narrow band of riparian vegetation. Wildlife movement is accommodated along the shoreline. There is little potential for connection to upland habitat although fragmented upland habitat is present in vacant lands to the west that have largely been disturbed in the past and have limited habitat value.</p> <p>SR F includes a Columbia River island, which is part of the McNary National Wildlife Refuge and provides a variety of riparian and upland habitat. In addition, the area provides resting area for a variety of waterfowl. The islands are isolated by water from most human disturbance but are subject to proximity impacts such as noise and light/glare.</p> <p>The National Wetland Inventory (NWI) has identified wetlands in SR B, SR C, and the north half of SR D. The shorelines are all modified; SR A has a boat launch, SR E has several boat docks and piers, and there is a road along the shore of the remaining reaches.</p> <p>Many fish species populate the Columbia River in this reach. Salmonid fish include Chinook (spring, summer, and fall), coho, chum (fall), pink, and sockeye salmon, as well as bull trout/Dolly Varden and steelhead and rainbow trout. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the nearby Yakima Basin. Lamprey are present but have experienced population decline in recent years. Other native fish species that can be found in the Columbia River near Richland include white sturgeon, bridgelip and mountain suckers, mottled sculpin, chiselmouth, redbelly darter, peamouth, and northern pikeminnow. Invasive species include bluegill, bass, crappie, shad, carp, channel catfish, perch, and walleye.</p> <p>Shellfish in the Columbia River near Richland include the Columbia River limpet, the Columbia River spire snail, and the California floater.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
SUBREACH A	
Level of Existing Function: Partially functioning	

RICHLAND	CITY OF RICHLAND
<p>Stressors: Water intake facilities and barge slip (dredged), armoring, legacy utility structures (maybe monitoring wells) informal recreation trails and water access, recreation use</p> <p>Potential Stressors: Within waterfront developed land use designations, will have development pressure</p> <p>Potential Restoration Opportunities: Increase density of riparian buffer, consider soft bank stabilization methods</p> <p>Potential Protection Opportunities: Limit public access to designated trails, protect shrub steppe consistent with WDFW guidelines</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Conservancy</p>	
<p>SUBREACH B</p>	
<p>Level of Existing Function: Partially functioning</p> <p>Stressors: Paved bike path, residential development with roads,</p> <p>Potential Stressors: Waterfront development and associated recreational activity increases</p> <p>Potential Restoration Opportunities: Replace invasive riparian species with native, maximize taller riparian vegetation near shoreline; to maintain views of river, infill with smaller trees and shrubs at top of bank</p> <p>Potential Protection Opportunities: Consider low irrigation/xeriscape options for landscaping on public and private parcels</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Parallel Recreation and Waterfront</p>	
<p>SUBREACH C</p>	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Paved bike path and desire paths lower on bank, non-native riparian species, limited industrial development but outside of the shoreline jurisdiction</p> <p>Potential Restoration Opportunities: Replace invasive riparian species with native</p> <p>Potential Protection Opportunities: Limit access to designated trails; consider reconnecting to larger regional trail to discourage informal trails</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Parallel Recreation and Waterfront</p>	
<p>SUBREACH D</p>	
<p>Level of Existing Function: Partially functioning (fully functioning at northern end)</p> <p>Stressors: Irrigated landscape associated with University, trails, water intake, and armoring</p> <p>Potential Stressors: Development pressure from institution</p>	

RICHLAND	CITY OF RICHLAND
<p>Potential Restoration Opportunities: Replace invasive riparian species with native and improve riparian vegetation in degraded or impacted areas, replace armor with soft shoreline techniques</p> <p>Potential Protection Opportunities: Protect existing mature riparian vegetation</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Waterfront</p>	
SUBREACH E	
<p>Level of Existing Function: Partially functioning</p> <p>Stressors: Private docks with trails down steep shoreline to them, impacted riparian buffer</p> <p>Potential Stressors: Single-family residential allows for 5 dwelling units per acre</p> <p>Potential Restoration Opportunities: Improve woody, drought tolerant vegetation at shoreline</p> <p>Potential Protection Opportunities: Protect existing native riparian vegetation, consider consolidating pathways to shoreline docks</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Residential</p>	
SUBREACH F	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Passive recreation</p> <p>Potential Restoration Opportunities: None</p> <p>Potential Protection Opportunities: Protection from recreation uses that limit ecological function or cultural resources</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Columbia River Islands Natural</p>	
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>SR A: Riverfront Trail</p> <p>SR B: Riverfront Trail</p> <p>SR C: Riverfront Trail</p> <p>SR D: WSU Tri Cities College Campus with Riverfront Trail</p> <p>SR E: None – there is an on-street trail route just outside shoreline jurisdiction</p> <p>SR F: McNary National Wildlife Refuge</p>	
Existing Public Access Goals:	

RICHLAND	CITY OF RICHLAND
<p>The Richland Comprehensive Plan includes a general objective to:</p> <ul style="list-style-type: none"> • Provide public access and use of the Columbia River and Yakima River shoreline in a manner that accommodates various uses but limits their impact on the natural environment <p>Also, the Comprehensive Land Use Plan does indicate an intent for passive or active open space as follows:</p> <ul style="list-style-type: none"> • SR A: Designated as developed open space in Comprehensive Land Use Plan • SR B: Portion designated as natural open space in Comprehensive Land Use Plan and a portion as waterfront, which is described as integrating recreation with other commercial, cultural, office, recreational and residential uses • SR C: Designated a portion as natural open space and developed open space in Comprehensive Plan • SR D: Designated as developed open space in Comprehensive Plan • SR E: A narrow strip of land on the shoreline is designated as natural open space adjacent to residential uses • SR F: The island is designated as natural open space 	
<p>Identified Public Access Improvements:</p> <p>None</p>	
<p>CUMULATIVE IMPACT CONSIDERATIONS</p>	
<p>Watershed level: The SMP has limited influence on Columbia River McNary dam operations by the U.S. Army Corps of Engineers, and upriver water quality conditions. Richland’s focus should be on preventing further degradation of Columbia River conditions.</p> <p>Reach level:</p> <ul style="list-style-type: none"> • Structural effects on habitat through road fragmentation and development within the uplands • Impacts from recreation use along the shoreline 	

RICHLAND		CITY OF RICHLAND
REACH 9	Reach Length: 2.75 mile (excluding islands)	
Shoreline Jurisdiction: 90.79 acres (excluding islands)		
		
Source: https://fortress.wa.gov/ecy/coastalatlantools/UICoastalAtlas/Tools/ShorePhotos.aspx		
Description: The shoreline within this reach extends along the right bank of the Columbia River from Spring Road to Howard Amon Park.		
Subreaches (SR), see Figure:		
SR A: Extends approximately 0.5 miles from Leslie Groves Park		
SR B: Extends approximately 0.6 miles from Snyder to Park Street		
SR C: Extends approximately 0.5 miles from Leslie Groves Park		
SR D: Extends approximately 0.8 miles from Symons Street		
SRs E & F: Includes the two islands, respectively.		
PHYSICAL CHARACTERISTICS		
Ownership: U.S. Army Corps of Engineers, City of Richland, and private		

RICHLAND	CITY OF RICHLAND
Existing Land Cover/Development: Vacant, public, and residential	
<p>Land Use/Current SMP:</p> <p>SR A:</p> <p>Current SMP Environment Designation: Urban</p> <p>Current Zoning: Natural open space</p> <p>Current Land Use: Open space</p> <p>Adjacent Land Use: Residential</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: None; open space provides for water enjoyment</p> <p>Non-water-related Uses: None</p> <p>Future Land Use: Natural open space is likely to be maintained.</p> <p>SR B:</p> <p>Current SMP Environment Designation: Urban</p> <p>Current Zoning: Park and public facility</p> <p>Adjacent Zoning: Park and public facility and residential</p> <p>Current Land Use: Water treatment facility intake</p> <ul style="list-style-type: none"> • Boat launch ramp and parking • Public park (Leslie Grove Park) <p>Water-dependent Uses: Water treatment facility intake</p> <ul style="list-style-type: none"> • Boat Launch Ramp and parking <p>Water-related Uses: Water enjoyment use of parks and open space</p> <p>Non-water-related Uses: Park recreation and passive use</p> <p>Future Land Use: There is unlikely to be any change in the existing park and open space.</p> <p>SR C:</p> <p>Current SMP Environment Designation: Urban</p> <p>Current Zoning: Natural open space/park and public facility</p> <p>Adjacent Zoning: Residential</p> <p>Current Land Use: Public park (Leslie Grove Park)</p> <p>Adjacent Land Use: Residential</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: Water enjoyment use of parks and open space</p> <p>Non-water-related Uses: Park recreation and passive use</p> <p>Future Land Use: There is unlikely to be any change in the existing park and open space</p> <p>SR D:</p> <p>Current SMP Environment Designation: Urban</p>	

RICHLAND	CITY OF RICHLAND
<p>Current Zoning: Park and public facility</p> <p>Adjacent Zoning: Residential</p> <p>Current Land Use: Public park</p> <p>Adjacent Land Use: Residential</p> <p>Water-dependent Uses: None</p> <p>Water-related Uses: Water enjoyment use of trail along levee Non-water-related Uses: Residential</p> <p>Future Land Use: There is unlikely to be any change in the existing park and open space or adjacent residential use</p> <p>SRs E and F include Seagull and Nelson islands in the Columbia River, which are part of the McNary National Wildlife Refuge.</p> <p>Current SMP Environment Designation: Natural</p>	
<p>Major Infrastructure: Public water access, public water system, Leslie Groves Park, Hains Avenue Levee Park</p>	
<p>Geomorphic Character: Reach 9 includes the east bank (right bank) and associated un-vegetated islands along the Columbia River. In this reach, the river is a mostly straight, incised, single-thread channel that is confined by urban/agricultural infrastructure. The geologic units are primarily flood deposits on the east bank while alluvial deposits make up the mid-channel islands (bars). The soils on the shoreline are made up of loamy sand and fine sandy loam.</p> <p>Hardened banks: Levees, docks and boat ramp structures along the shoreline and hardening around the water intake structure.</p>	
<p>Flooding and Geological Hazards: The mid- to channel islands are mapped in FEMA High Risk Flood Areas, but the bank is stable and unlikely to be susceptible to flood risks in its current form.</p>	
<p>Channel Migration Zone: Per Ecology, a CMZ delineation is not necessary for the Columbia River.</p>	
<p>REACH CHARACTERIZATION AND ANALYSIS</p>	
<p>Water Quantity and Sediment: Water quantity is dependent on Columbia River (specifically Priest Rapids Dam) operations. There are no major surface water inputs in this reach. The City has a water intake in SR A.</p>	
<p>Water Quality: Nearby impervious surfaces from roads and residential roofs may contribute stormwater runoff in SRs A, B, C, and D.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Columbia River supports migratory waterfowl as a resting and feeding area. Some nesting may occur. The Columbia River islands also provide a breeding area for long billed curlew and a variety of gulls, as well as a resting area with limited nesting for great blue heron and great egret.</p> <p>SRs A through D include Seagull and Nelson islands in the Columbia River, which provide a limited range of</p>	

RICHLAND	CITY OF RICHLAND
<p>habitat for species with lifecycle stages related to water due to the narrow band of riparian vegetation. Wildlife movement is accommodated along the shoreline. There is little potential for connection to upland habitat although fragmented upland habitat is present in vacant lands to the west that have largely been disturbed in the past and have limited habitat value. Some areas provide cover, understory and food sources for songbirds, shorebirds and small mammals.</p> <p>The National Wetland Inventory (NWI) has identified wetlands in SR A and SR C. The shorelines are all modified and have adjacent residential development as well as a riverfront trail.</p> <p>Many fish species populate the Columbia River in this reach. Salmonid fish include Chinook (spring, summer, and fall), coho, chum (fall), pink, and sockeye salmon, as well as bull trout/Dolly Varden and steelhead and rainbow trout. Coho salmon were historically present here, and there is currently a coho reintroduction program underway in the nearby Yakima Basin. Lamprey are present but have experienced population decline in recent years. Other native fish species that can be found in the Columbia River near Richland include white sturgeon, bridgelip and mountain suckers, mottled sculpin, chiselmouth, redbelly dace, peamouth, and northern pikeminnow. Invasive species include bluegill, bass, crappie, shad, carp, channel catfish, perch, and walleye. Shellfish in the Columbia River near Richland include the Columbia River limpet, the Columbia River spire snail, and the California floater.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
SUBREACH A	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Passive recreation, designated public access point</p> <p>Potential Restoration Opportunities: Manage for invasive species in riparian buffer</p> <p>Potential Protection Opportunities: Manage activity within designated trails</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Residential</p>	
SUBREACH B	
<p>Level of Existing Function: Impaired</p> <p>Stressors: Water intake structure, boat ramp, armored, parking lot, irrigated and sprayed turf grass at top of bank, recreation use</p> <p>Potential Restoration Opportunities: Look for opportunities for xeriscape landscaping, BMP for landscape maintenance, invasive species removal along shoreline</p> <p>Potential Protection Opportunities: Protect existing native, mature riparian vegetation</p>	
<p>Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Residential</p>	

RICHLAND	CITY OF RICHLAND
SUBREACH C	
Level of Existing Function: Partially functioning	
Stressors: Riparian vegetation bisected by multi-use trail	
Potential Restoration Opportunities: Improve riparian vegetation	
Potential Protection Opportunities: Protect existing native riparian vegetation	
Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Residential	
SUBREACH D	
Level of Existing Function: Impaired	
Stressors: Levee (with clearing of riparian vegetation for management), path, armored shoreline, invasive species	
Potential Restoration Opportunities: Evaluate restoration options in front of levee	
Potential Protection Opportunities: Preserve existing vegetation, minimize removal for levee management	
Preliminary Shoreline Environment Designation Considerations: Parallel Recreation and Residential	
SUBREACH E	
Level of Existing Function: Functioning	
Stressors: Passive recreation	
Potential Restoration Opportunities: None	
Potential Protection Opportunities: Protection from recreation uses that limit ecological function or cultural resources	
Preliminary Shoreline Environment Designation Considerations: Columbia River Islands Natural	
PUBLIC ACCESS	
Existing Public Access: Reach 9 contains the Riverfront Trail; Leslie Groves Park, with a wide variety of active waterfront facilities including docks and a launch (SRs A, B, and C); and Hains Avenue Levy Park (SR D). The river islands in SR E are mapped as natural open space on the Comprehensive Land Use Plan.	
Existing Public Access Goals: The Richland Comprehensive Plan includes a general objective to: <ul style="list-style-type: none"> • Provide public access and use of the Columbia River and Yakima River shoreline in a manner that accommodates various uses but limits their impact on the natural environment. 	

RICHLAND	CITY OF RICHLAND
CUMULATIVE IMPACT CONSIDERATIONS	
<p>Watershed level: The SMP has limited influence on Columbia River McNary dam operations by the Corps of Engineers, and upriver degradation of water quality conditions. Richland’s focus should be on preventing further degradation of Columbia River conditions.</p>	
<p>Reach level:</p>	
<ul style="list-style-type: none"> • Chemical contaminant impacts from recreation infrastructure and landscaping • Structural effects on habitat through road fragmentation and overwater structures • Shoreline hardening/stabilization through recreation development • Existing levees to protect structures • Other impacts including from recreation use 	

RICHLAND		CITY OF RICHLAND
REACH 10	Reach Length: 2.12 mile	
Shoreline Jurisdiction: 67.72 acres		
		
Source: https://fortress.wa.gov/ecy/coastalAtlas/UICoastalAtlas/Tools/ShorePhotos.aspx		
<p>Description: The shoreline within this reach extends about 2 miles along the right bank of the Columbia River from the north end of Howard Amon Park to the I-182 bridge. The reach includes shoreline areas managed by the City as park and open space, as well as residential and commercial uses, including a marina.</p>		
<p>Subreaches (SR), see Figure:</p> <p>SR A: Extends approximately 0.7 miles through Howard Amon Park</p> <p>SR B: Extends approximately 0.7 miles from the south end of Howard Amon Park</p> <p>SR C: Extends approximately 0.7 miles from ending at the I-182 bridge</p>		
PHYSICAL CHARACTERISTICS		
Ownership: U.S. Army Corps of Engineers, City of Richland, and private		
Existing Land Cover/Development: Public park, residential, and commercial		
<p>Land Use/Current SMP:</p> <p>SR A includes about 3,500 feet of shoreline between the north end of Howard Amon Park to the Hampton Inn at about the alignment of Falley Street.</p> <p>Current SMP Environment Designation: Urban</p> <p>Current Zoning: Parks and public facilities</p> <p>Current Shoreline Land Use: Boat Launch and associated parking</p> <ul style="list-style-type: none"> Public Park <p>Adjacent Land Use: Commercial (largely behind existing levee or steep slope)</p> <p>Water-dependent Uses: Boat launch</p> <p>Water-related Uses: Open space provides for water enjoyment</p> <p>Non-water-related Uses: Variety of non-water-related recreation</p> <p>Future Land Use: Continued park use is anticipated</p>		

RICHLAND**CITY OF RICHLAND**

SR B extends along about 3,000 feet of the shoreline from the Hampton Inn to the boundary of existing development at the Columbia Point Marina.

Current SMP Environment Designation: Urban

Current Zoning: Waterfront, Park and public facility, Multi-family

Adjacent Zoning: Same as shoreline zoning Current Land Use: Hotels, Residential townhomes, Vacant land, Park and trail use

Water-dependent Uses: None

Water-related Uses: Public trail along waterfront

Non-water-related Uses: Hotels

Future Land Use: There is limited private land available. The most likely site is redevelopment of the Shilo Rivershore Inn to multiple use.

SR C extends along about 4,000 feet of the shoreline from the boundary of existing development at the Columbia Point Marina area to the I-182 bridge.

Current SMP Environment Designation: Urban

Current Zoning: Multi-family, Waterfront, (Columbia Point Marina vicinity) Park and public facility (Columbia Point Marina Park)

Adjacent Zoning: Same as shoreline zoning

Current Land Use: Multi-family development, Restaurant, Marina, Public Park, Boat launch ramp and parking

RICHLAND	CITY OF RICHLAND
<p>Water-dependent Uses: Marina, Boat launch ramp and parking</p> <p>Water-related Uses: Water enjoyment use of parks and open space</p> <p>Non-water related Uses: Hotels, Park recreation and passive use</p> <p>Future Land Use: There is limited private land available. No likely development sites in this subreach have been identified.</p>	
<p>Major Infrastructure: Public water access, public water system, Howard Amon Park, Columbia Point Marina Park, Columbia Point Golf Course, and I-182 and crossing</p>	
<p>Geomorphic Character: Reach 10 includes the south bank (right bank) of the Columbia River immediately upstream of the Interstate 182 Bridge (and the confluence with the Yakima River). This stable, incised, single-thread channel has low sinuosity and is confined by urban/agricultural infrastructure. It narrows from north to south. The soils consist primarily of loamy sand and fine sandy loam.</p> <p>Hardened banks: Docks, 2 boat ramps and a breakwater in the marina facility.</p>	
<p>Flooding and Geological Hazards: None of this reach is mapped in the FEMA High Risk Flood Areas, and the bank is stable and unlikely to be susceptible to flood risks in its current form.</p>	
<p>Channel Migration Zone: Per Ecology, a CMZ delineation is not necessary for the Columbia River.</p>	
REACH CHARACTERIZATION AND ANALYSIS	
<p>Water Quantity and Sediment: Water quantity is dependent on Columbia River (specifically McNary Dam) operations. The mouth of the Yakima River is located at the downstream end of Reach 10C.</p>	
<p>Water Quality: Nearby impervious surfaces from roads and residential roofs may contribute stormwater runoff in Reach 10. Additionally, a golf course may contribute surface runoff in SR B, and a marina may impact water quality in SR C.</p>	
<p>Habitat Characteristics and PHS Species Presence:</p> <p>No threatened or endangered terrestrial species present in the immediate vicinity.</p> <p>The water area of the Columbia River supports migratory waterfowl as a resting and feeding area. Some nesting may occur.</p> <p>All reaches provide a limited range of habitat for species with lifecycle stages related to water due to the narrow band of riparian vegetation or the lack of vegetation. The high public pedestrian volumes on trails along the waterfront limit wildlife use. Wildlife movement not likely to be accommodated along the shoreline except for species adept at swimming. There is little nearby upland habitat in vacant lands or the golf course</p>	

RICHLAND	CITY OF RICHLAND
<p>and therefore little opportunity for movement.</p> <p>The National Wetland Inventory (NWI) has identified a small wetland in Reach 10B. The shorelines are all highly modified and include a marina, residential development, and the riverfront trail.</p> <p>Many fish species populate the Columbia River in this reach. Salmonid fish include Chinook (spring, summer, and fall), coho, chum (fall), pink, and sockeye salmon, as well as bull trout/Dolly Varden and steelhead and rainbow trout. Coho salmon were historically present here, and a coho reintroduction program is currently underway in the nearby Yakima Basin. Lamprey are present but have experienced population decline in recent years. Other native fish species that can be found in the Columbia River near Richland include white sturgeon, bridgelip and mountain suckers, mottled sculpin, chiselmouth, redbelt shiner, peamouth, northern pikeminnow. Invasive species include bluegill, bass, crappie, shad, carp, channel catfish, perch, and walleye.</p>	
ECOLOGICAL FUNCTIONS ANALYSIS (BY SUBREACH)	
SUBREACH A	
<p>Level of Existing Function: Impaired</p> <p>Stressors: Levee (with clearing of riparian vegetation for management), path, armored shoreline, invasive species, boat launch, multiple over water structures and ramp, irrigated turf grass, riparian vegetation lacking, recreation use, and paved areas near water including parking lot</p> <p>Potential Restoration Opportunities: Consider options for soft shore armoring techniques to stabilize shoreline below lawn areas, increase riparian vegetation while still allowing for shoreline access and views, and BMPS for irrigated turfgrass areas to reduce pesticide runoff.</p> <p>Potential Protection Opportunities: Manage shoreline access to allow for further riparian and soft shoreline enhancements</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Recreation</p>	
SUBREACH B	
<p>Level of Existing Function: Functioning</p> <p>Stressors: Armored groin protecting legacy boat ramp, multi use trail, limited riparian buffer in between development and water, invasive species (Russian-olive and milfoil), recreation use</p> <p>Potential Stressors: Waterfront development and redevelopment</p> <p>Potential Restoration Opportunities: Manage invasive species, evaluate restoring natural shoreline plan and cross section (consider groin and boat ramp area)</p> <p>Potential Protection Opportunities: Protect native riparian vegetation</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Waterfront</p>	

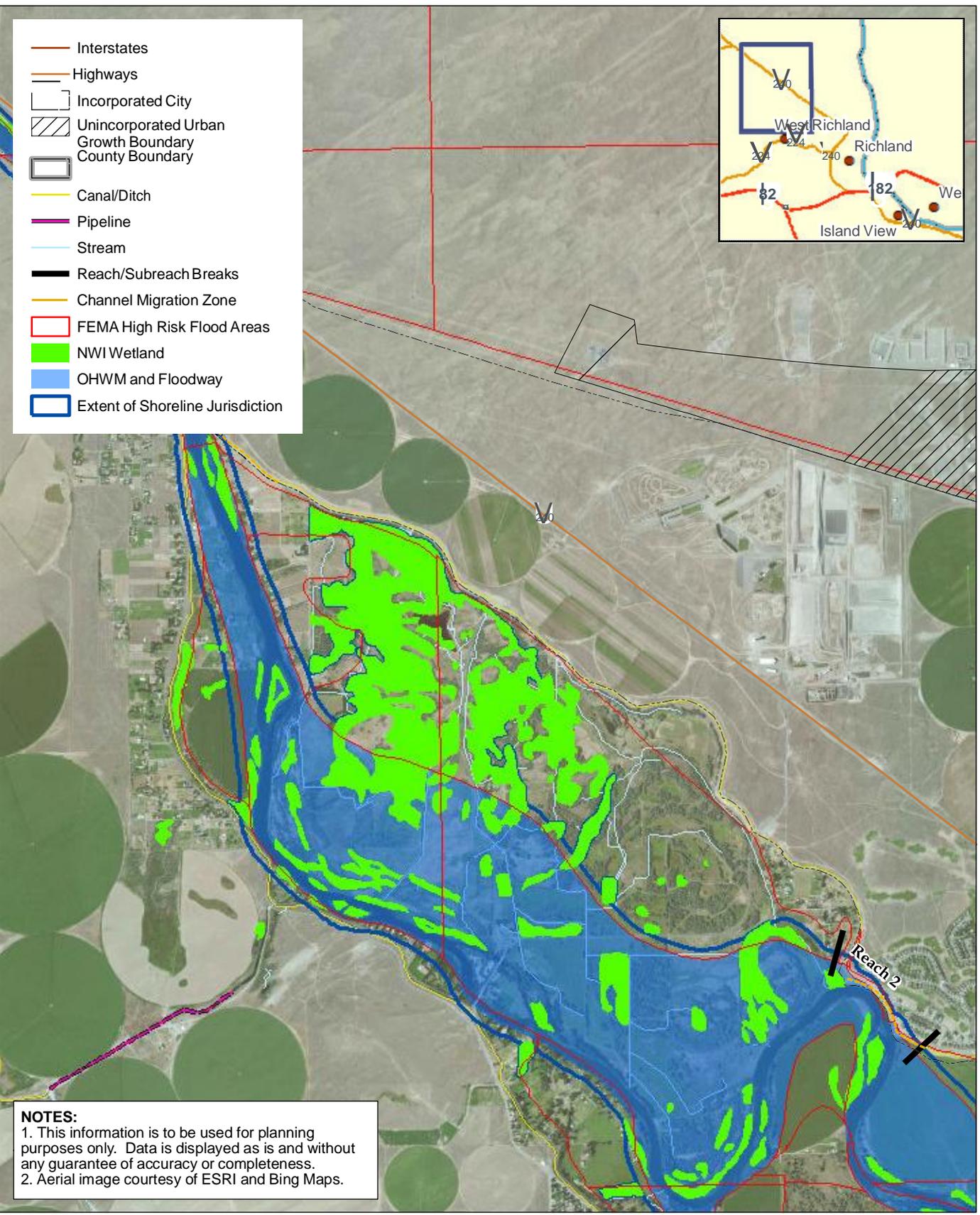
RICHLAND	CITY OF RICHLAND
SUBREACH C	
<p>Level of Existing Function: Impaired</p> <p>Stressors: Marina with armored breakwater/multiple over water structures, private development near shoreline, multiuse trail, limited riparian vegetation particularly within marina, park with managed lawn, boat ramp, some invasive species (Russian-olive), bank erosion potentially from boat wake, and recreation use</p> <p>Potential Stressors: Waterfront zoning allows for potential development. Multiple-family residential allows for 10 or more dwelling units per acre.</p> <p>Potential Restoration Opportunities: Riparian planting with native species, evaluate soft shoreline around park; Marina park landscape maintenance BMPs</p> <p>Potential Protection Opportunities: Protect existing native riparian plants</p>	
<p>Preliminary Shoreline Environment Designation Considerations:</p> <p>Waterfront</p>	
PUBLIC ACCESS	
<p>Existing Public Access:</p> <p>Reach 10 includes several facilities with the Riverfront Trail as a connector:</p> <ul style="list-style-type: none"> • Howard Amon Park with a swim dock and boat launch as well as other active recreation facilities (SR A) • Columbia Point Marina Park (SR C) including a boat launch and transient moorage • The Columbia Point Golf Course is located outside of shoreline jurisdiction. 	
<p>Existing Public Access Goals:</p> <p>The Richland Comprehensive Plan includes a general objective to:</p> <ul style="list-style-type: none"> • Provide public access and use of the Columbia River and Yakima River shoreline in a manner that accommodates various uses but limits their impact on the natural environment 	
<p>Identified Public Access Improvements:</p> <p>The Final parks plan (City of Richland 2012) identifies improvements by 2014 to Howard Amon Park consisting of the South Howard Amon Park shelter replacement and trail rebuild.</p> <p>The Comprehensive Plan Capital Facilities Element also includes a couple of objectives regarding Howard Amon Park:</p> <ul style="list-style-type: none"> • Complete improvements to the Riverfront Trail as designated in the Howard Amon Master Plan and Callison Plan • Complete reconstruction and enhancement of the Howard Amon Park parking lot and Lee Boulevard in accordance with the Howard Amon Park Master Plan 	

RICHLAND	CITY OF RICHLAND
CUMULATIVE IMPACT CONSIDERATIONS	
<p>Watershed level: The SMP has limited influence on Columbia River McNary dam operations by the Corps of Engineers, and upriver degradation of water quality conditions. Richland's focus should be on preventing further degradation of Columbia River conditions.</p>	
<p>Reach level:</p> <ul style="list-style-type: none"> • Impervious surfaces leading to habitat loss and potential runoff • Vegetation alterations removing organic material and increasing soil erosion • Chemical contaminant impacts from recreation infrastructure and development • Structural effects on habitat through overwater structures • Shoreline hardening/stabilization through recreation development 	

APPENDIX B
MAP FOLIO

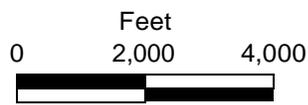
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-  Interstates
-  Highways
-  Incorporated City
-  Unincorporated Urban Growth Boundary
-  County Boundary
-  Canal/Ditch
-  Pipeline
-  Stream
-  Reach/Subreach Breaks
-  Channel Migration Zone
-  FEMA High Risk Flood Areas
-  NWI Wetland
-  OHWM and Floodway
-  Extent of Shoreline Jurisdiction



NOTES:
 1. This information is to be used for planning purposes only. Data is displayed as is and without any guarantee of accuracy or completeness.
 2. Aerial image courtesy of ESRI and Bing Maps.

FINAL



Map 2a
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

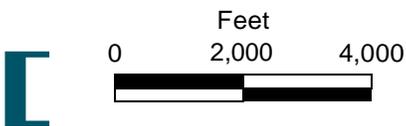
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-  Interstates
-  Highways
-  Incorporated City
-  Unincorporated Urban Growth Boundary
-  County Boundary
-  Canal/Ditch
-  Pipeline
-  Stream
-  Reach/Subreach Breaks
-  Channel Migration Zone
-  FEMA High Risk Flood Areas
-  NWI Wetland
-  OHWM and Floodway
-  Extent of Shoreline Jurisdiction



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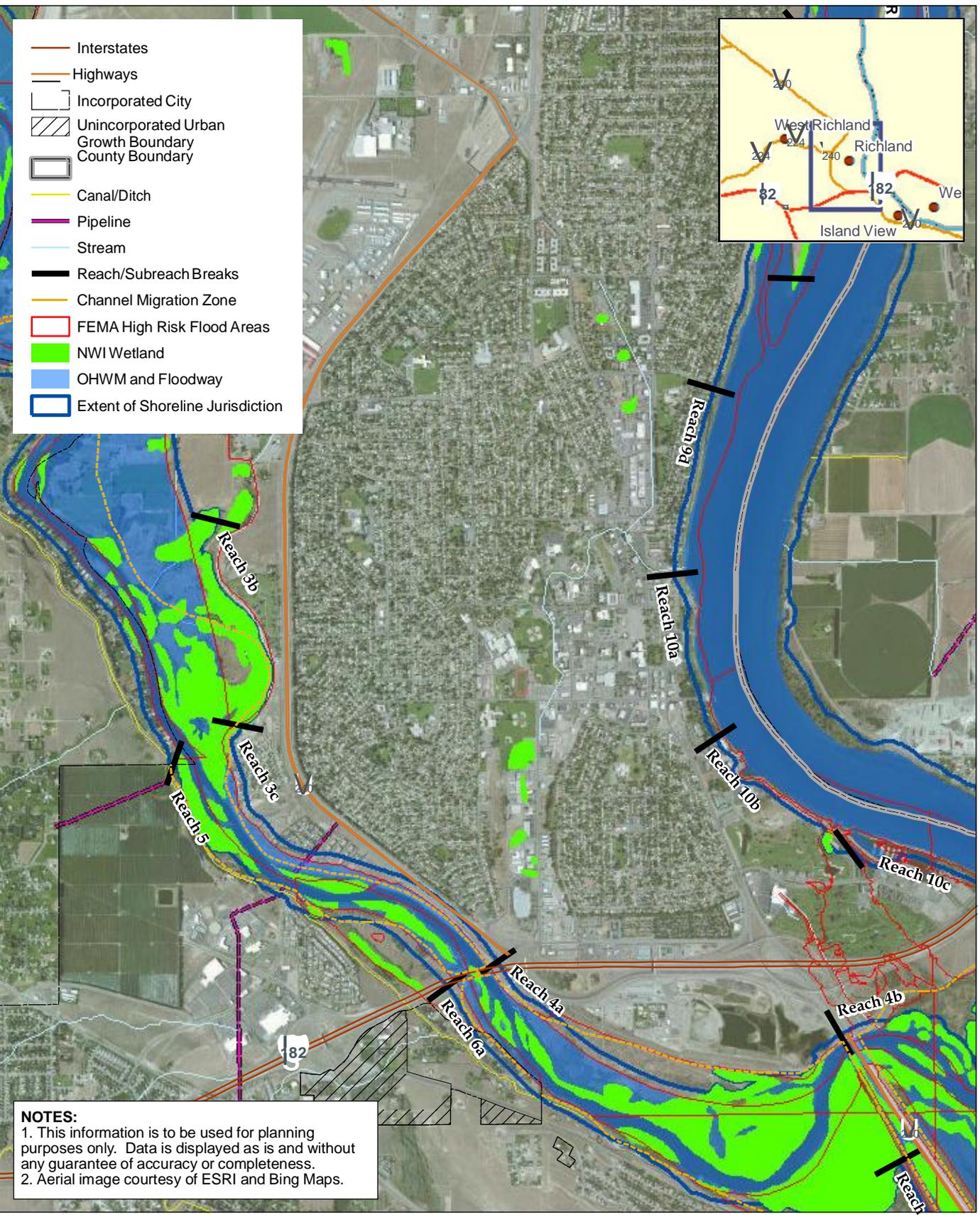
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Map 2b
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

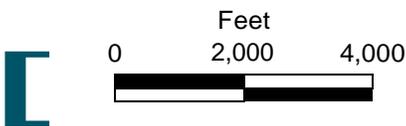
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- Interstates
- Highways
- Incorporated City
- Unincorporated Urban Growth Boundary
- County Boundary
- Canal/Ditch
- Pipeline
- Stream
- Reach/Subreach Breaks
- Channel Migration Zone
- FEMA High Risk Flood Areas
- NWI Wetland
- OHWM and Floodway
- Extent of Shoreline Jurisdiction



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 2. Aerial image courtesy of ESRI and Bing Maps.

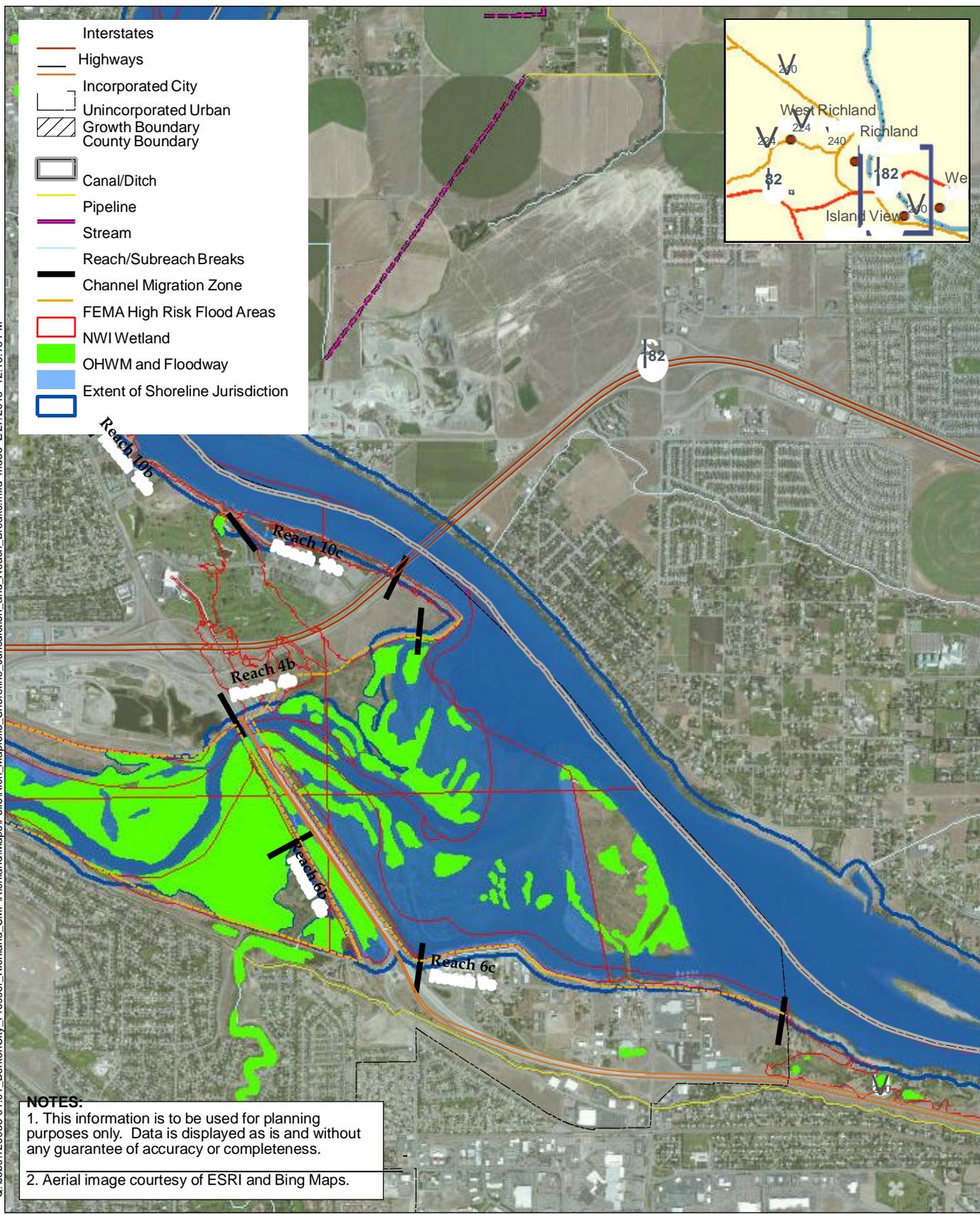
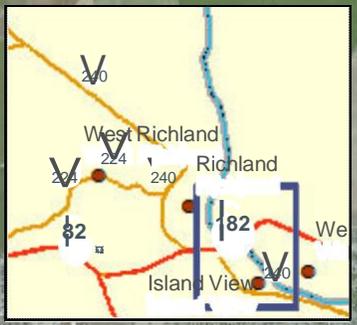
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Map 2c
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

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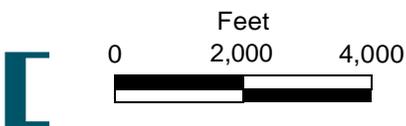
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-  Highways
-  Incorporated City
-  Unincorporated Urban
-  Growth Boundary
-  County Boundary
-  Canal/Ditch
-  Pipeline
-  Stream
-  Reach/Subreach Breaks
-  Channel Migration Zone
-  FEMA High Risk Flood Areas
-  NWI Wetland
-  OHWM and Floodway
-  Extent of Shoreline Jurisdiction



NOTES:

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2. Aerial image courtesy of ESRI and Bing Maps.

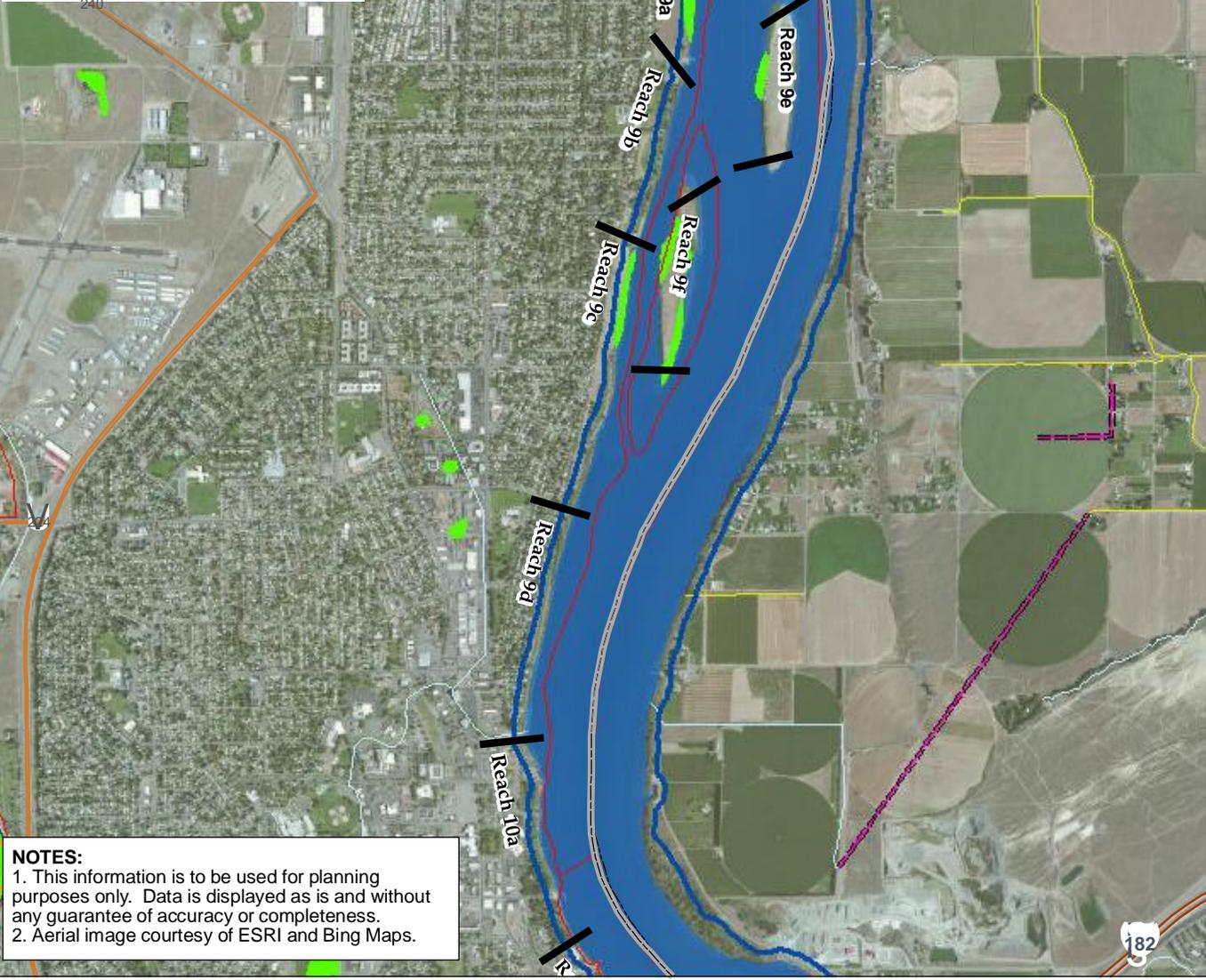
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Map 2d
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

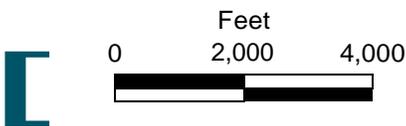
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-  Interstates
-  Highways
-  Incorporated City
-  Unincorporated Urban Growth Boundary
-  County Boundary
-  Canal/Ditch
-  Pipeline
-  Stream
-  Reach/Subreach Breaks
-  Channel Migration Zone
-  FEMA High Risk Flood Areas
-  NWI Wetland
-  OHWM and Floodway
-  Extent of Shoreline Jurisdiction



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 2. Aerial image courtesy of ESRI and Bing Maps.

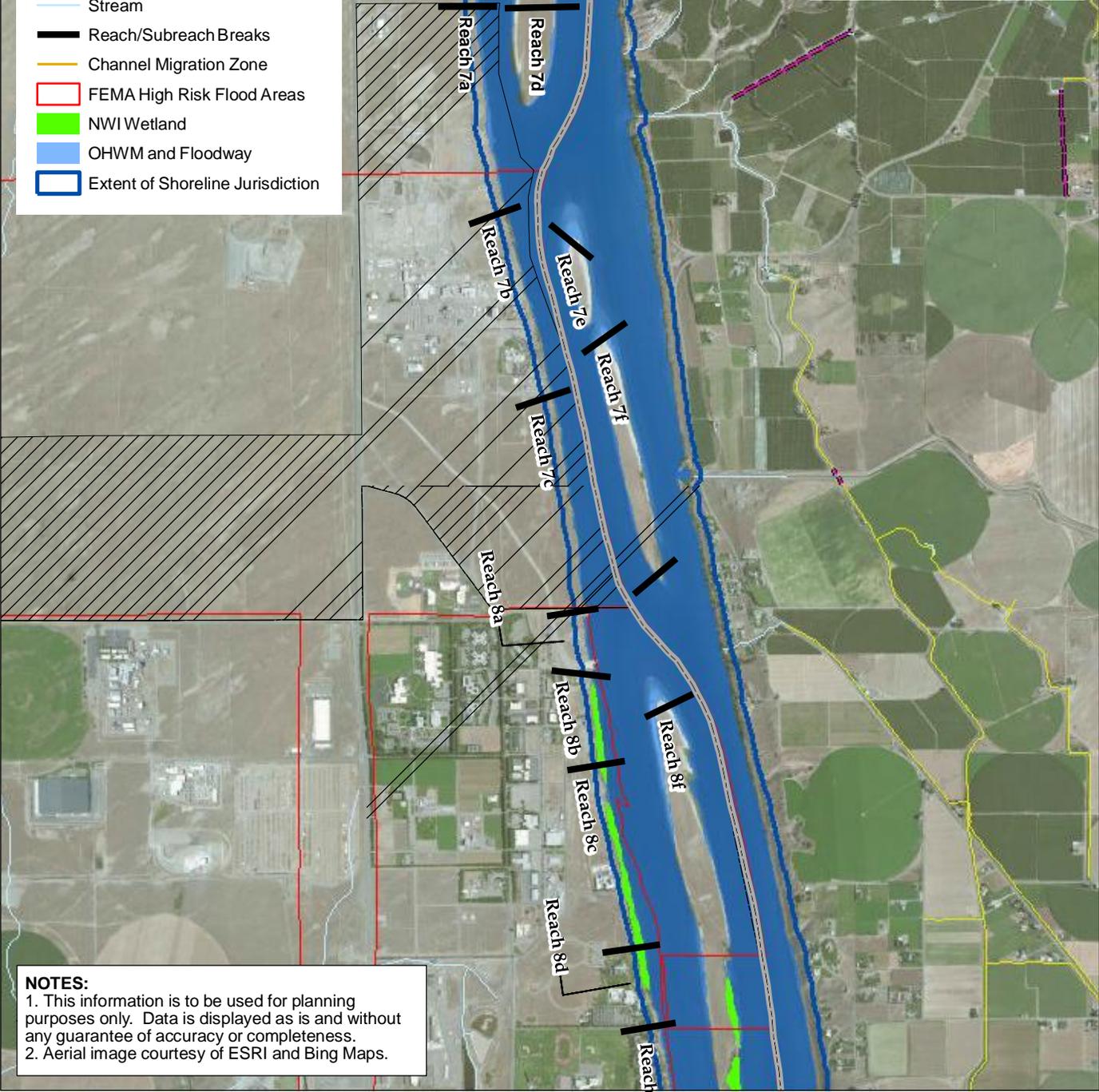
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Map 2e
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

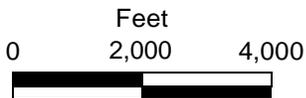
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-  Interstates
-  Highways
-  Incorporated City
-  Unincorporated Urban Growth Boundary
-  County Boundary
-  Canal/Ditch
-  Pipeline
-  Stream
-  Reach/Subreach Breaks
-  Channel Migration Zone
-  FEMA High Risk Flood Areas
-  NWI Wetland
-  OHWM and Floodway
-  Extent of Shoreline Jurisdiction



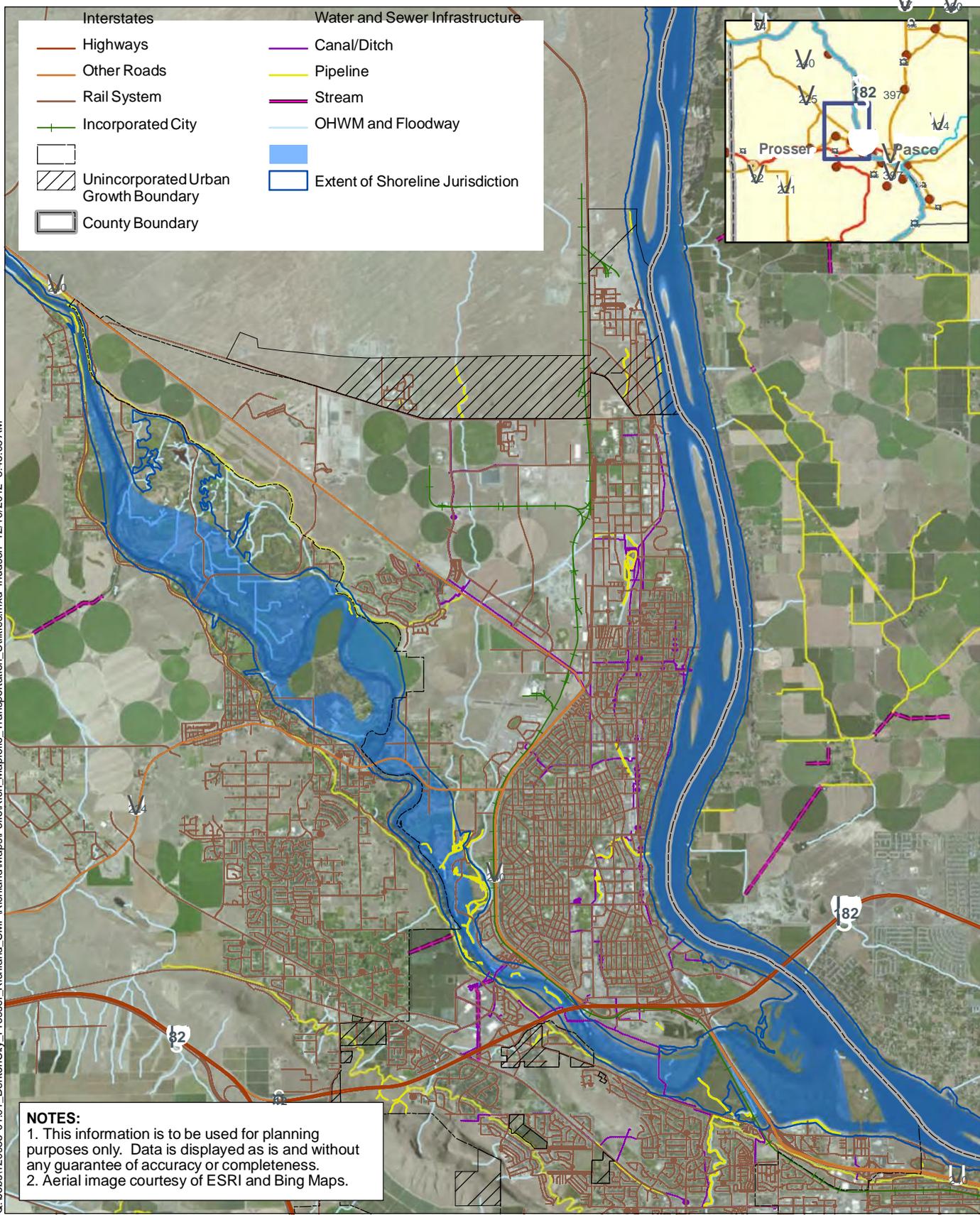
NOTES:
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Map 2f
 Shoreline Jurisdiction and Reaches
 Richland Shoreline Master Program
 Richland, WA

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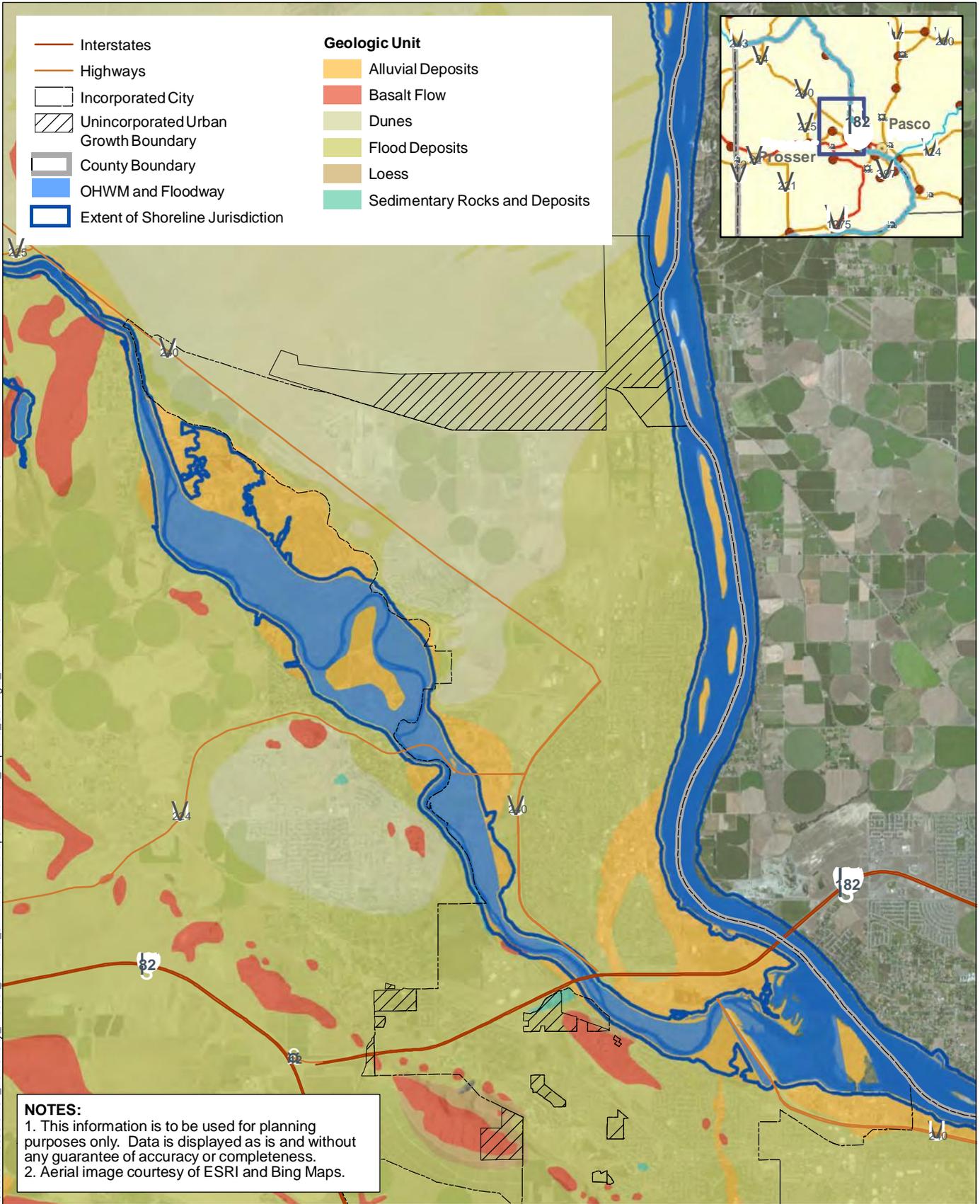
Interstates		Water and Sewer Infrastructure	
	Highways		Canal/Ditch
	Other Roads		Pipeline
	Rail System		Stream
	Incorporated City		OHWM and Floodway
	Unincorporated Urban Growth Boundary		Extent of Shoreline Jurisdiction
	County Boundary		

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ap 3 Transportation
and Utilities
Richland Shoreline
Master Program
Richland, WA

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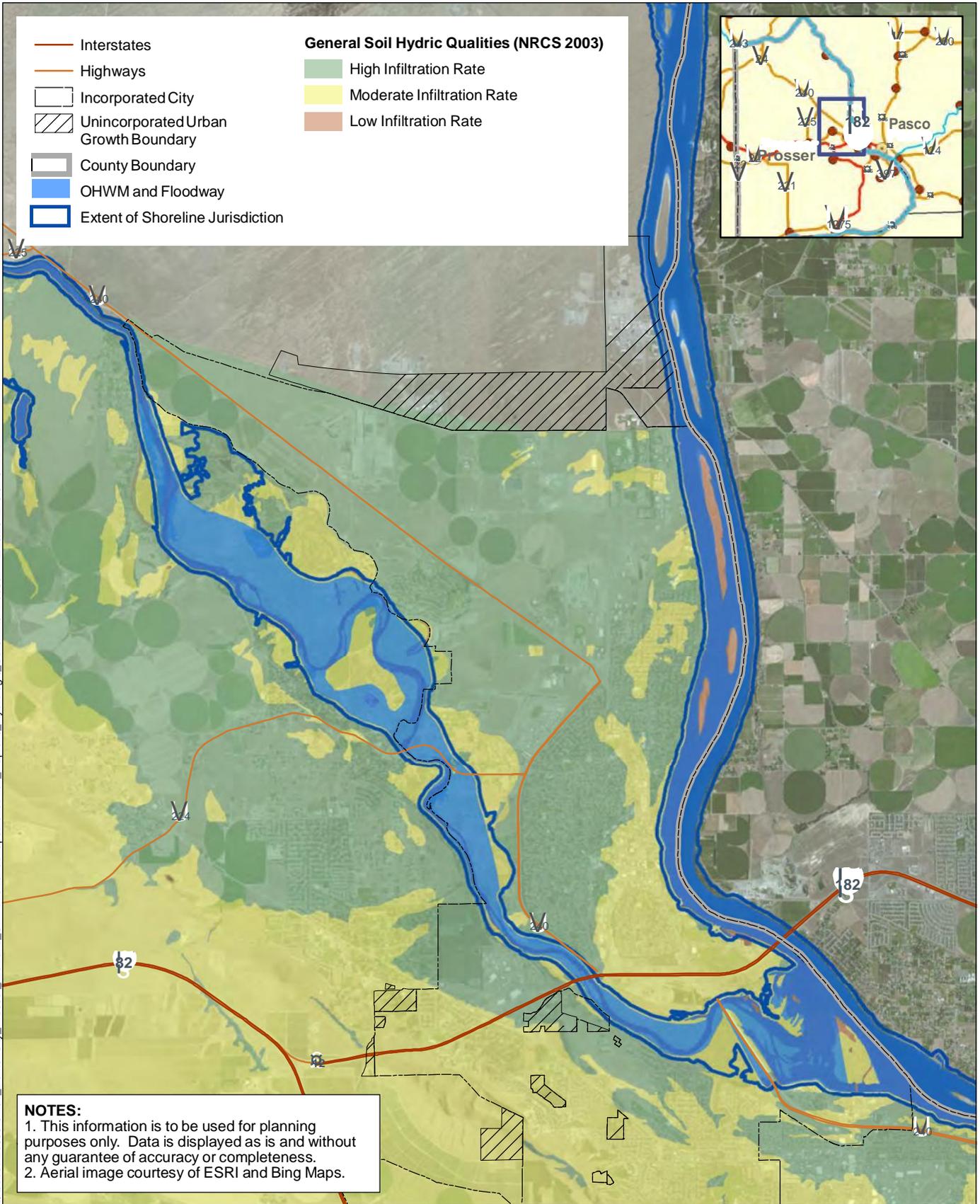


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Map 4
Geologic Formations
Richland Shoreline Master Program
Richland, WA

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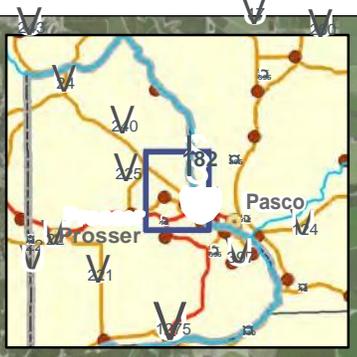


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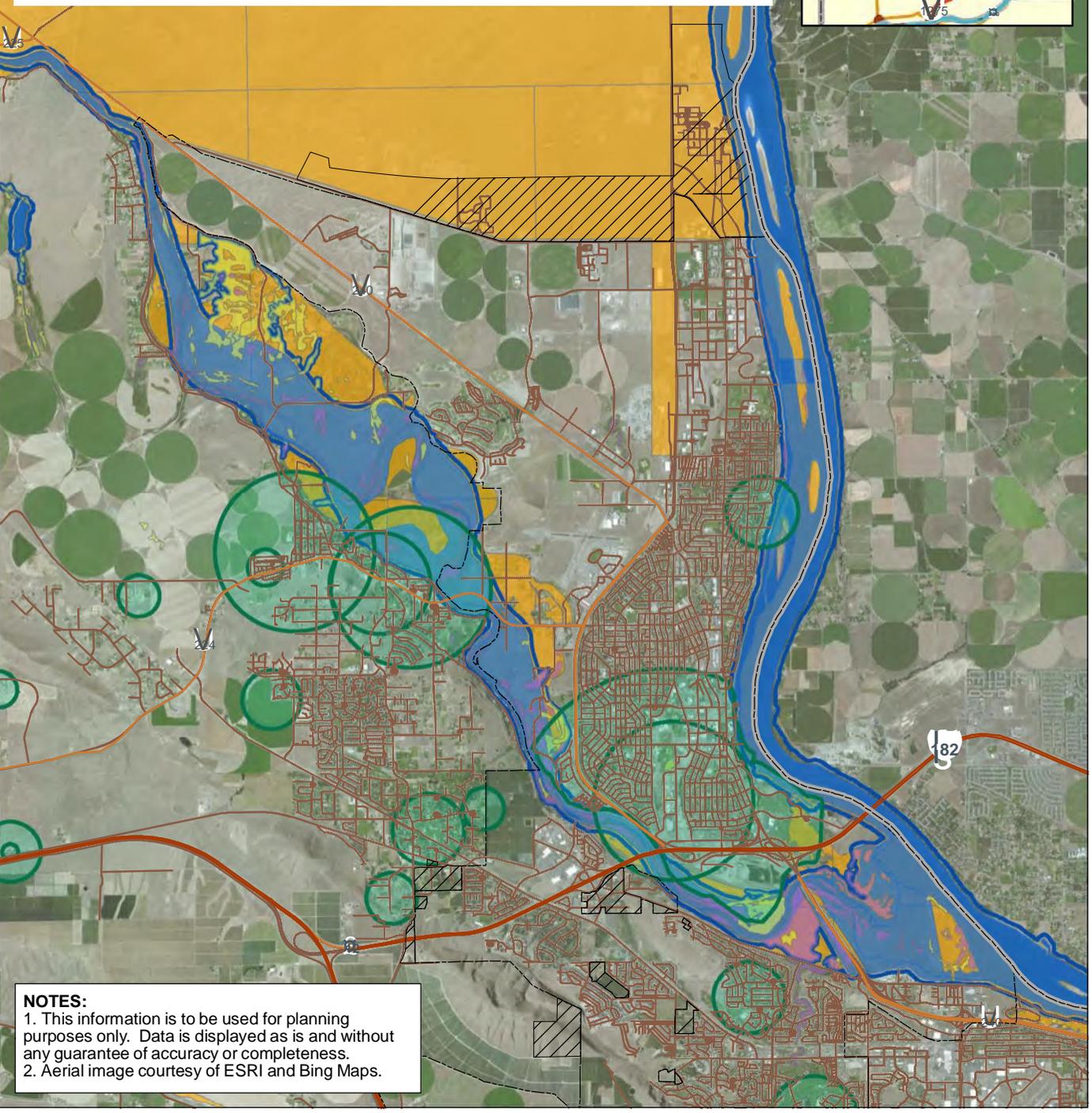


Map 5
Hydrologic Soils
Richland Shoreline Master Program
Richland, WA

 Interstates	 Public Water Supplies Protection Area - 10yr Travel Time
 Highways	 Freshwater Emergent Wetland
 Other Roads	 Freshwater Forested/Shrub Wetland
 Incorporated City	 FEMA High Risk Flood Areas
 Unincorporated Urban Growth Boundary	 OHW and Floodway
 County Boundary	 Extent of Shoreline Jurisdiction



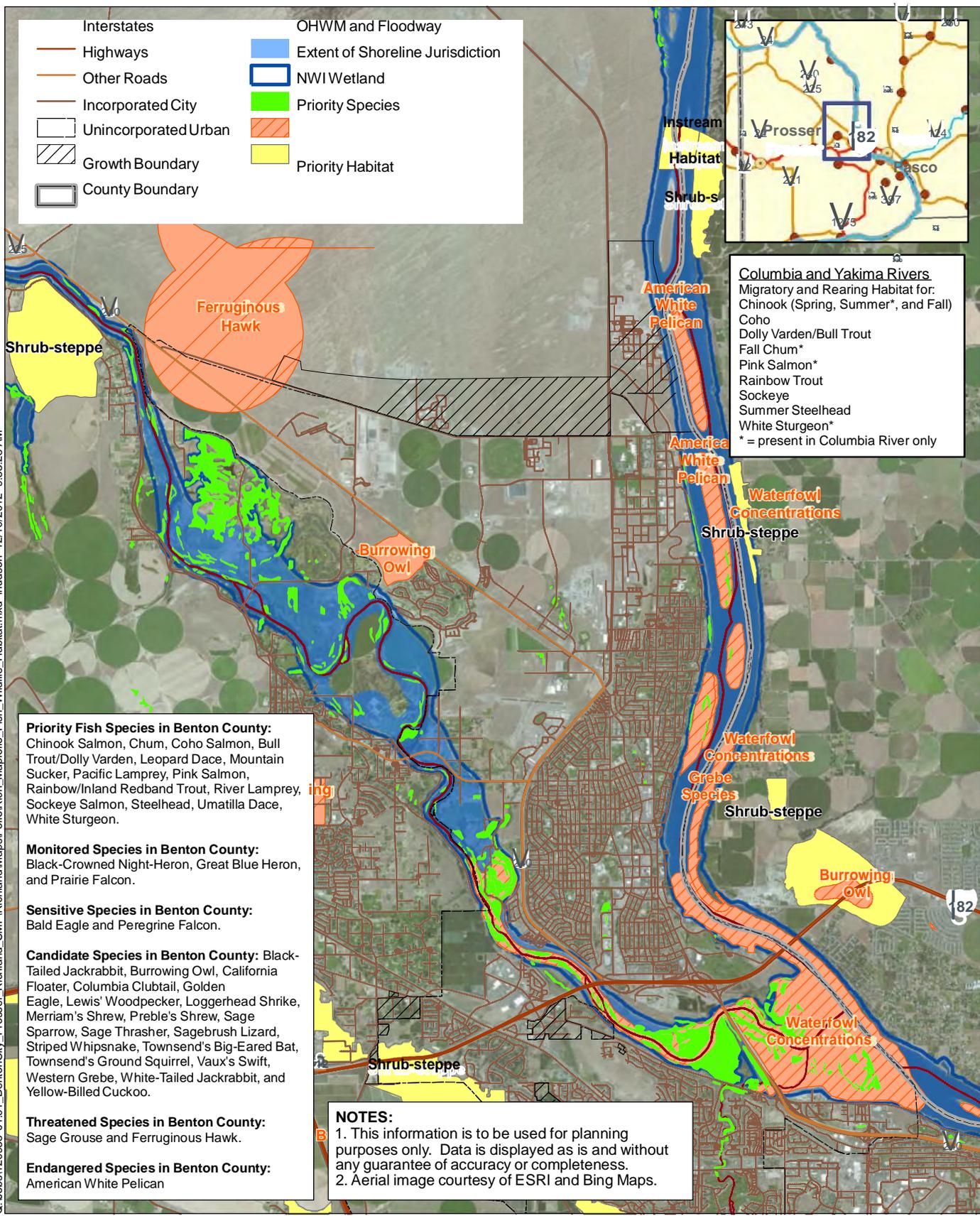
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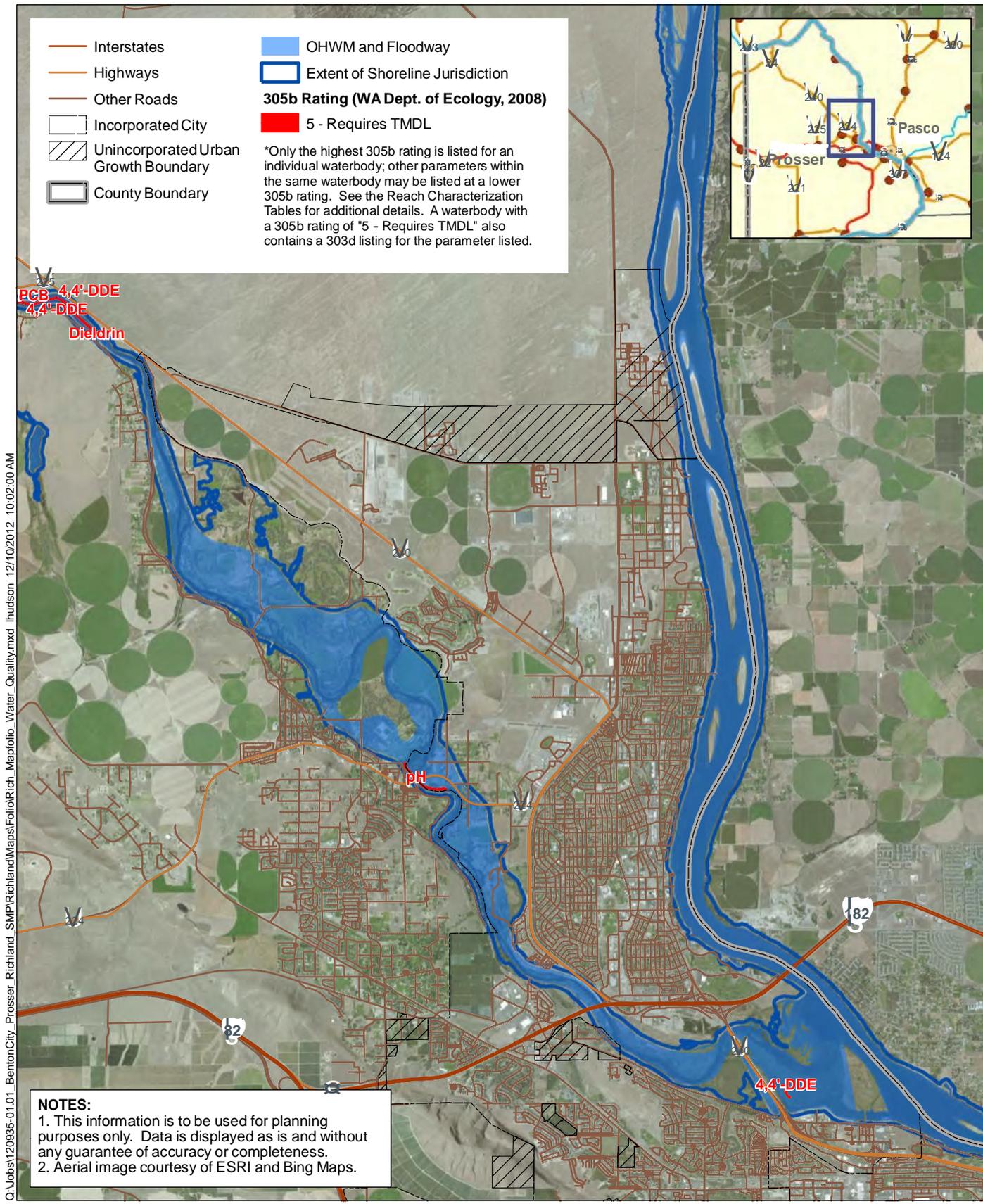
Map 6
Critical Areas
Richland Shoreline
Master Program
Richland, WA

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ap 7 Fish, Wildlife,
and Habitat Areas
Richland Shoreline
Master Program
Richland, WA

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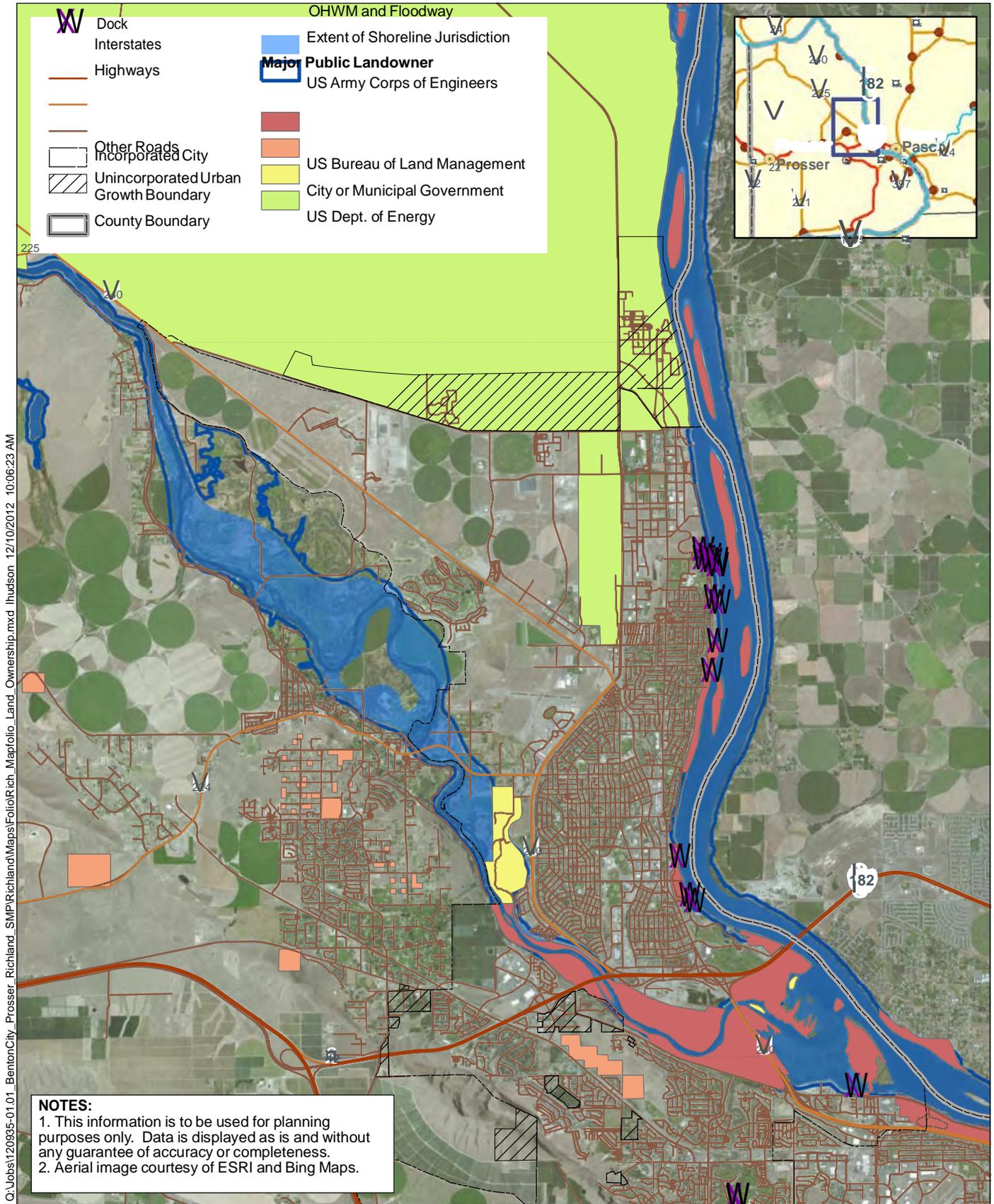
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Map 8
Water Quality Assessment
Richland Shoreline Master Program
Richland, WA



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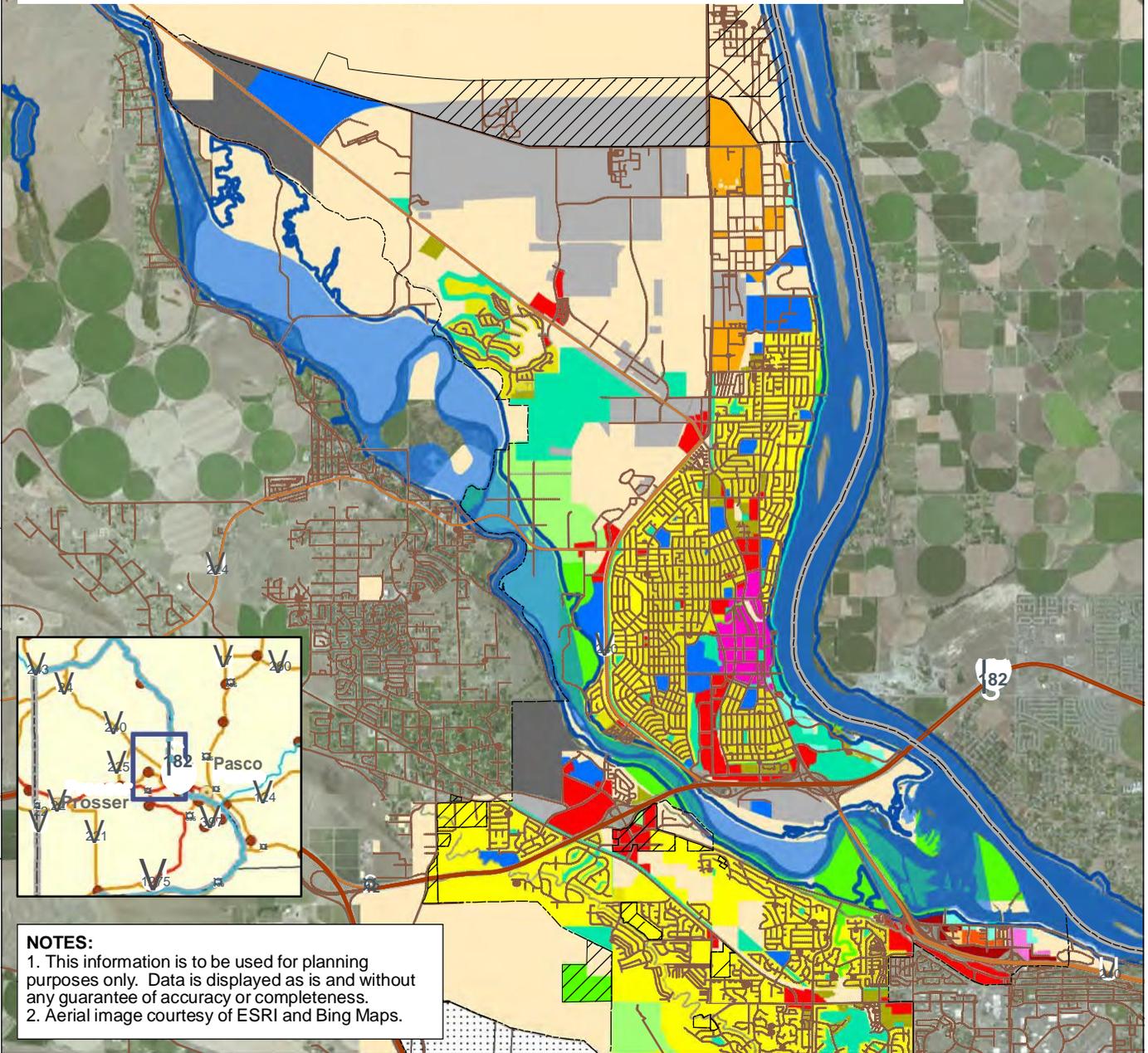
Richland Shoreline Master Program

V

- Interstates
- Highways
- Other Roads
- ▭ Incorporated City
- ▨ Unincorporated Urban Growth Boundary
- ▭ County Boundary
- ▭ OHHM and Floodway
- ▭ Extent of Shoreline Jurisdiction

- Land Use**
- ▭ Agriculture
 - ▭ Commercial
 - ▭ Business Research Park
 - ▭ Business Commerce
 - ▭ General Commercial
 - ▭ Retail Regional
 - ▭ Multifamily Residential Office
 - ▭ Central Business District
 - ▭ Industrial

- ▭ Public Facility
- ▭ Low Density Residential
- ▭ Medium Density Residential
- ▭ High Density Residential
- ▭ Waterfront
- ▭ Natural Open Space
- ▭ Developed Open Space
- ▭ Urban Reserve
- ▨ Badger Mountain South Area
- ▭ Split

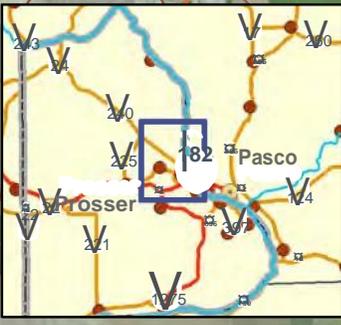
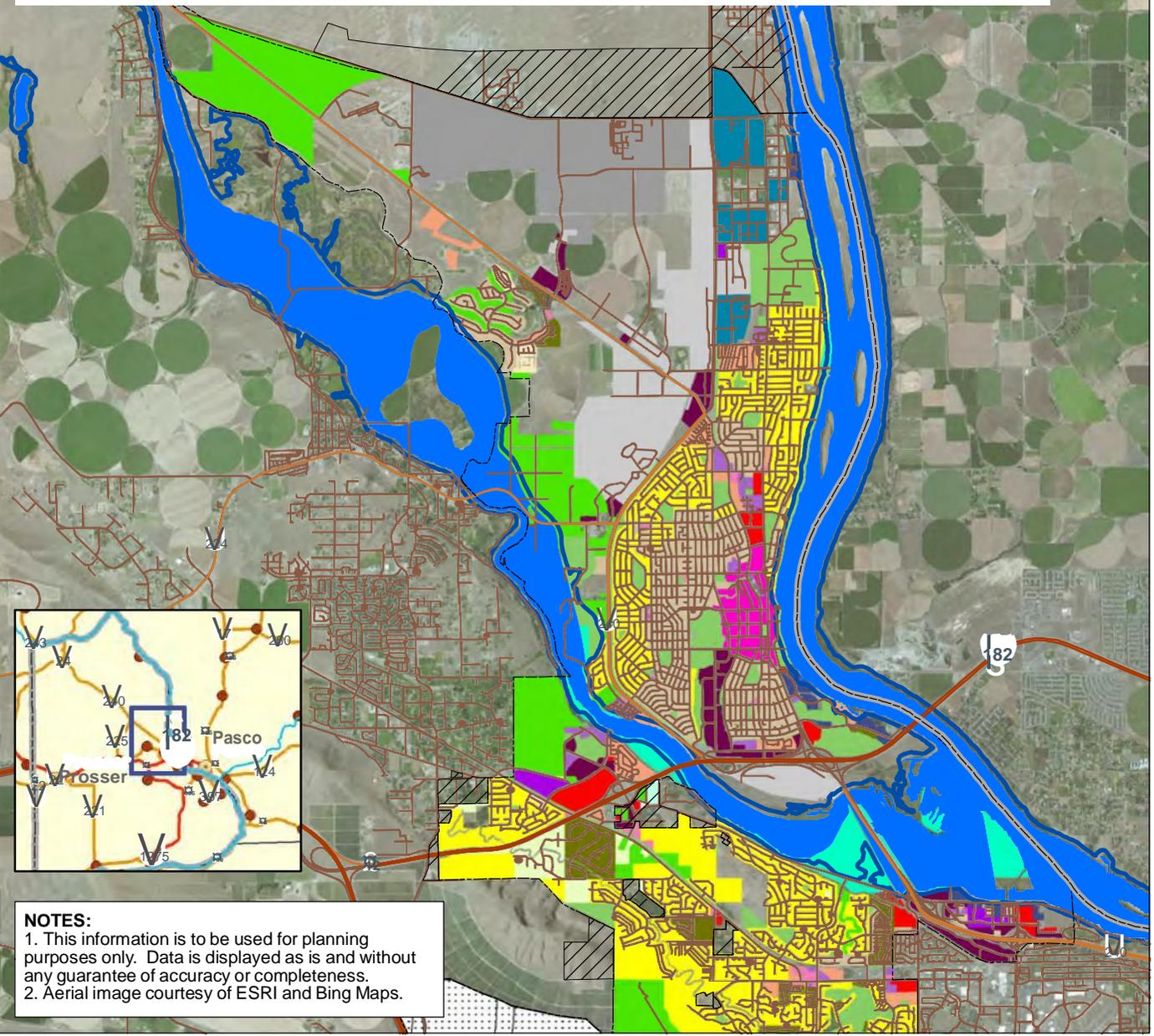


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Interstates	Primary Zoning Districts	Medium Industrial
Highways	Agricultural	Heavy Manufacturing
Other Roads	Badger Mountain South Area	Natural Open Space
Incorporated City	Business Commerce	Parks & Public Facilities
Unincorporated Urban Growth Boundary	Business Research Park	Planned Unit Development
County Boundary	Neighborhood Retail Business	Single Family Residential
OHWM and Floodway	Retail Business	Medium Density Residential
Extent of Shoreline Jurisdiction	General Business	Medium Density Residential Small Lot
	Limited Business	Multiple Family Residential
	Central Business District	Suburban Agriculture
	Commercial	Waterfront

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