Appendix A. Bibliography

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Appendix B.1. Complete Streets

The information contained in this Appendix is organized in the following subsections:

Analysis Maps

- Study Area
- Ownership
- Land Use
- Existing Storm Drainage
- Soil Types
- Catchment Areas
- Circulation – Bike and Sidewalk
- Circulation – Trails
- Parking
- Viewshed Analysis
- Lighting
- Underutilized Properties

Issues Maps

- Street Typology – Current Ferry Routing
- Street Typology – Ferry Relocation
- Active Shared Use Major
- Shared Use Minor
- Outlying Commercial
- Residential
- Ferry Commuter

Recommendation Maps

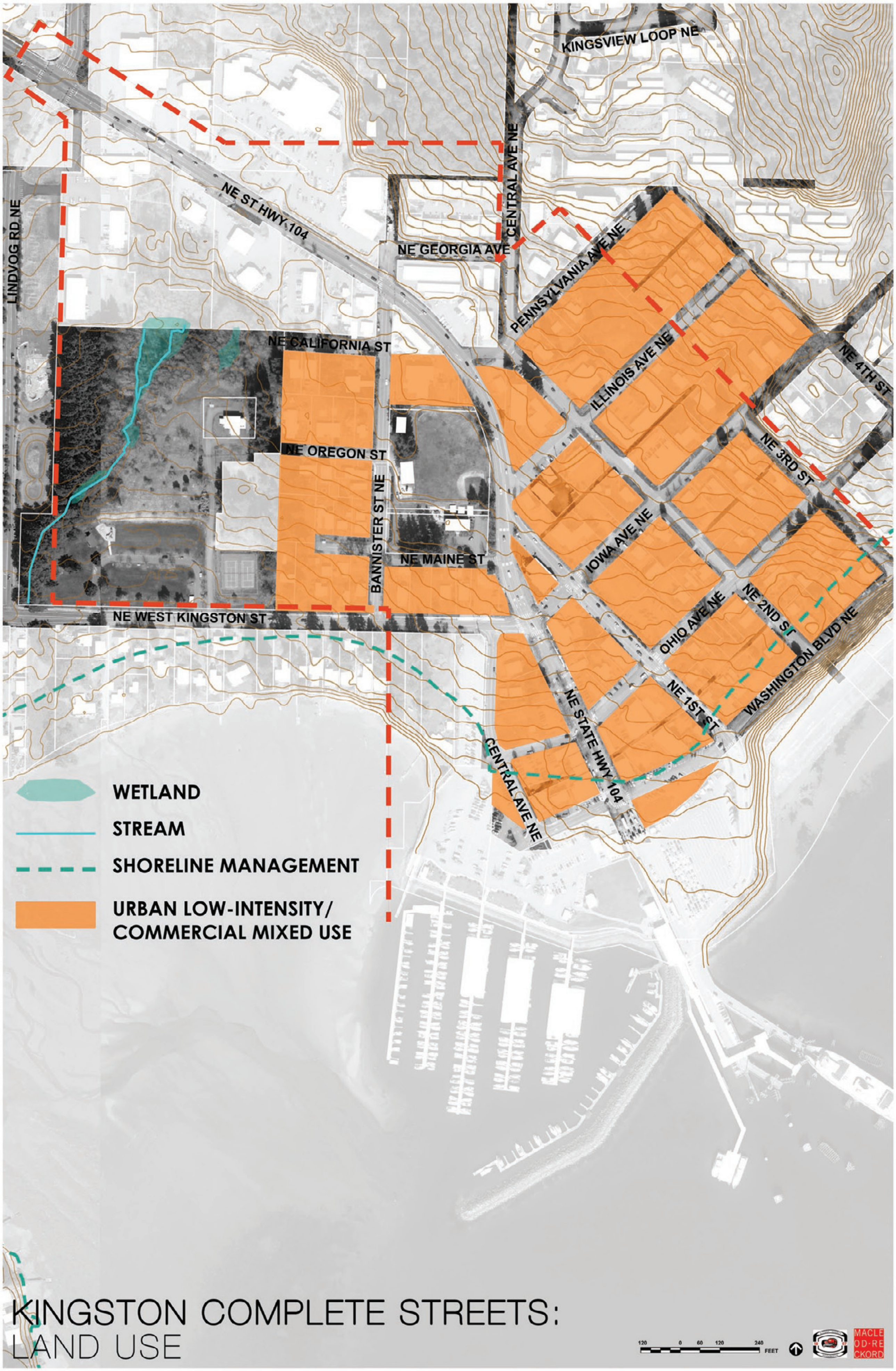
- Projects Overview

KINGSTON COMPLETE STREETS:

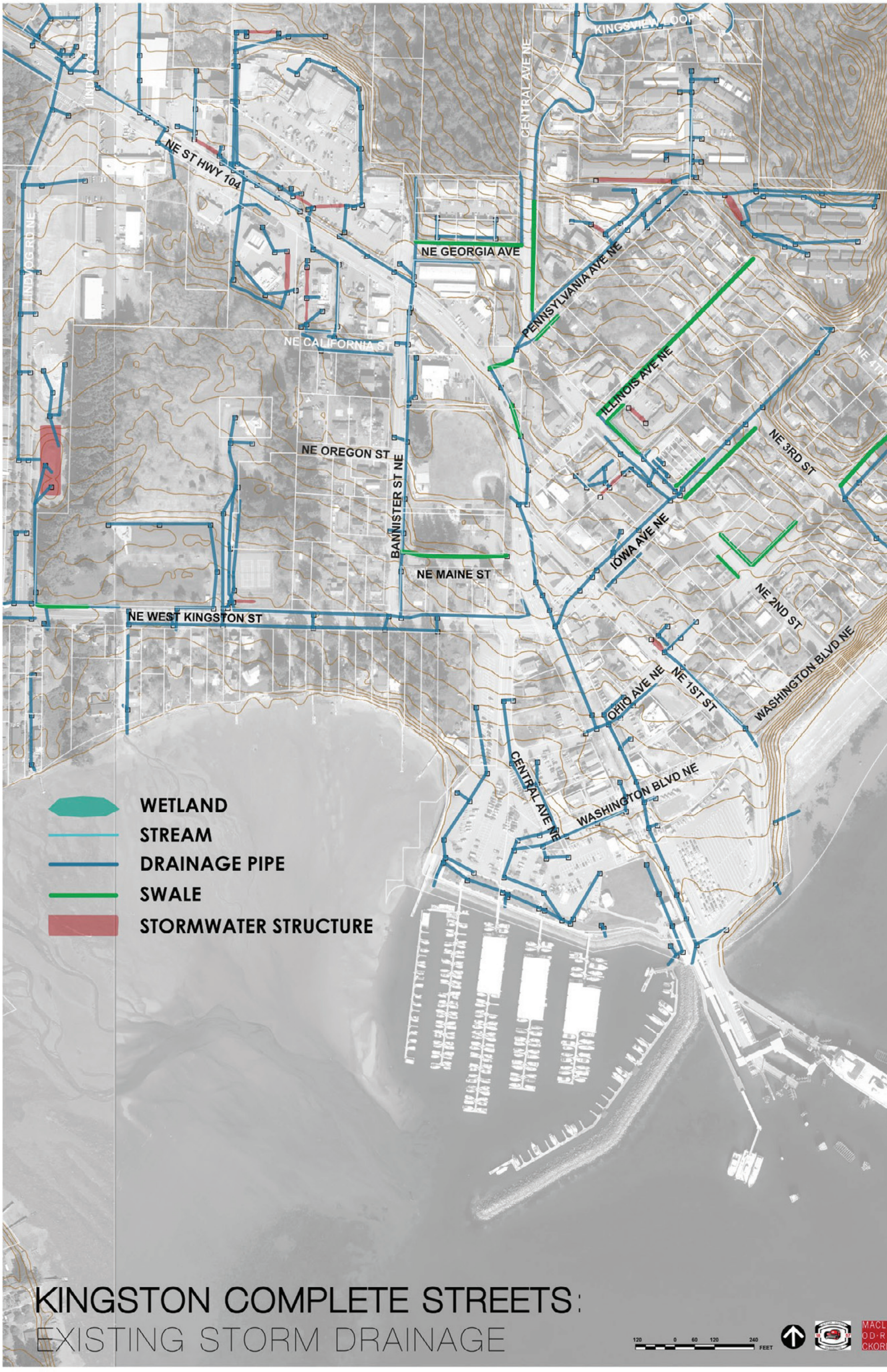
STUDY AREA

MACLE OD-RE CKORD

KINGSTON COMPLETE STREETS:
OWNERSHIP

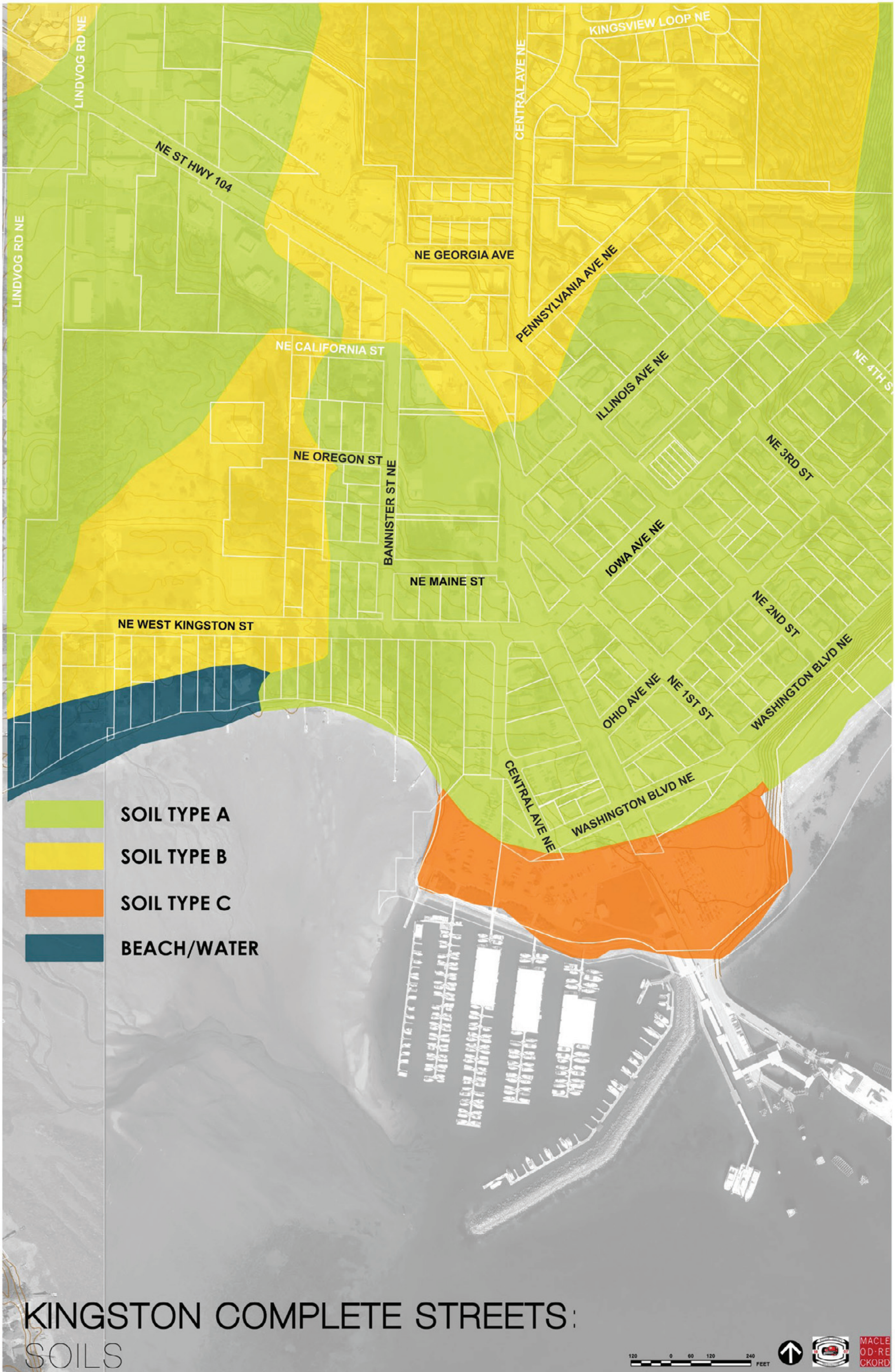


KINGSTON COMPLETE STREETS:
LAND USE

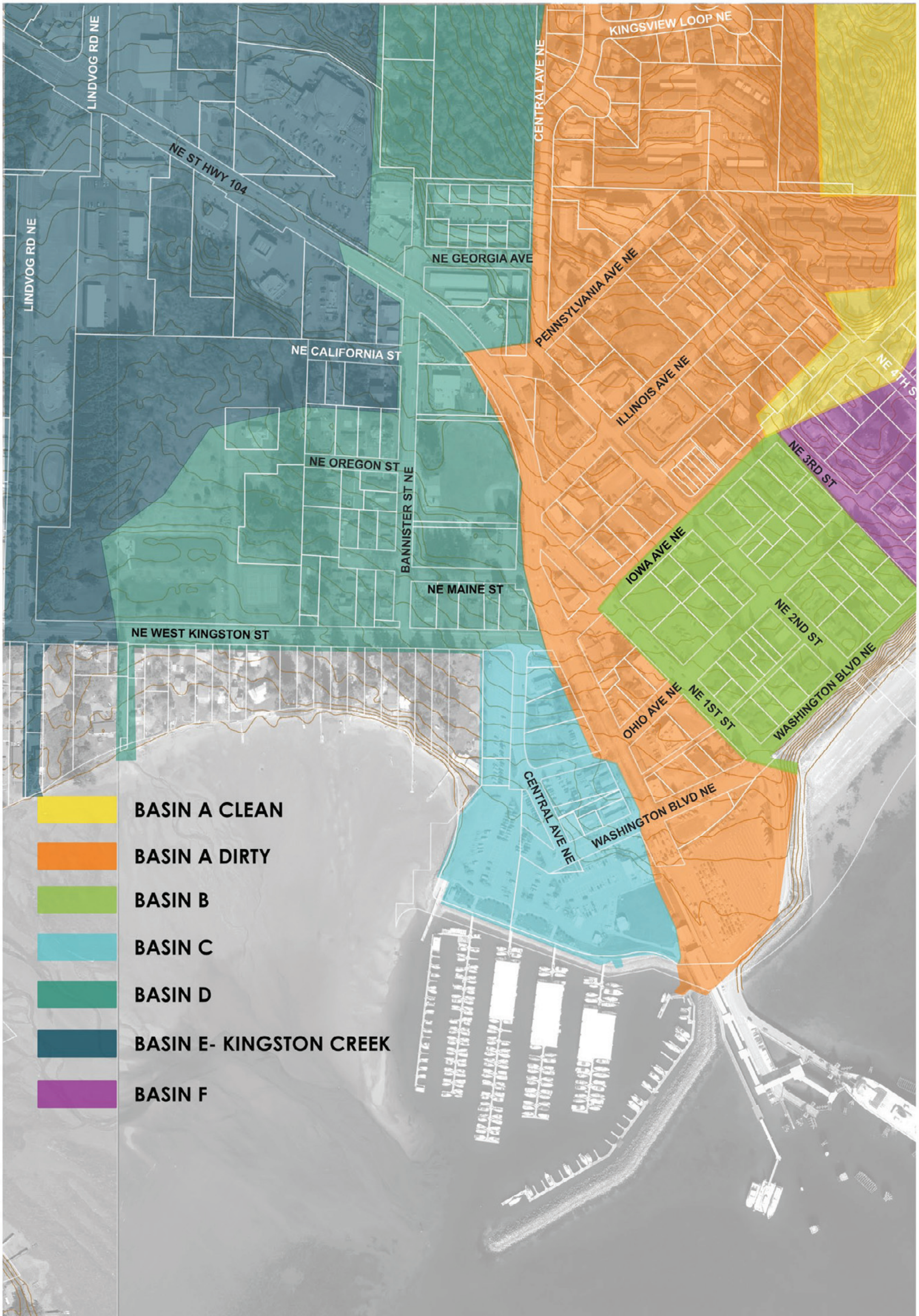


KINGSTON COMPLETE STREETS:

EXISTING STORM DRAINAGE

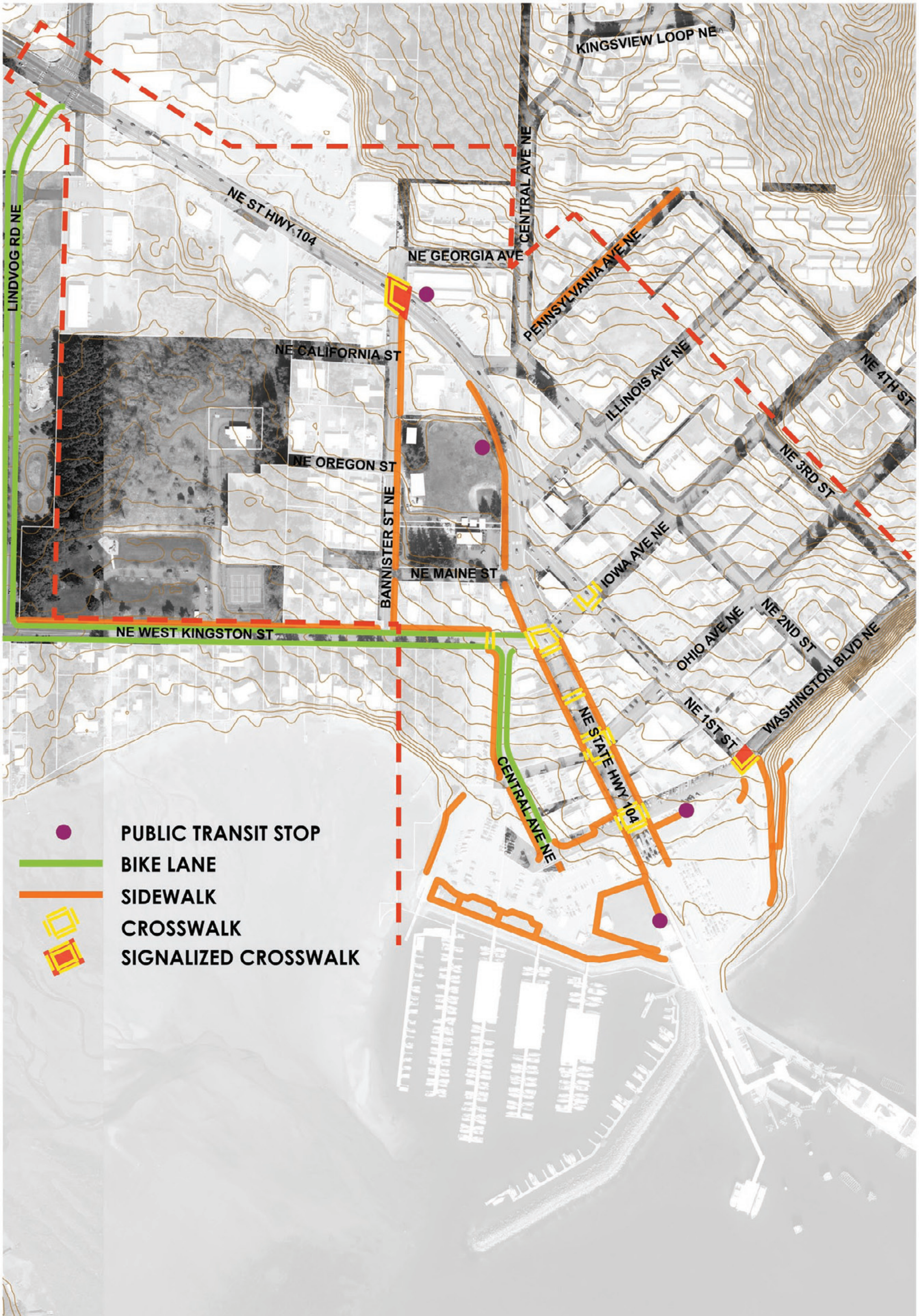


KINGSTON COMPLETE STREETS:
SOILS

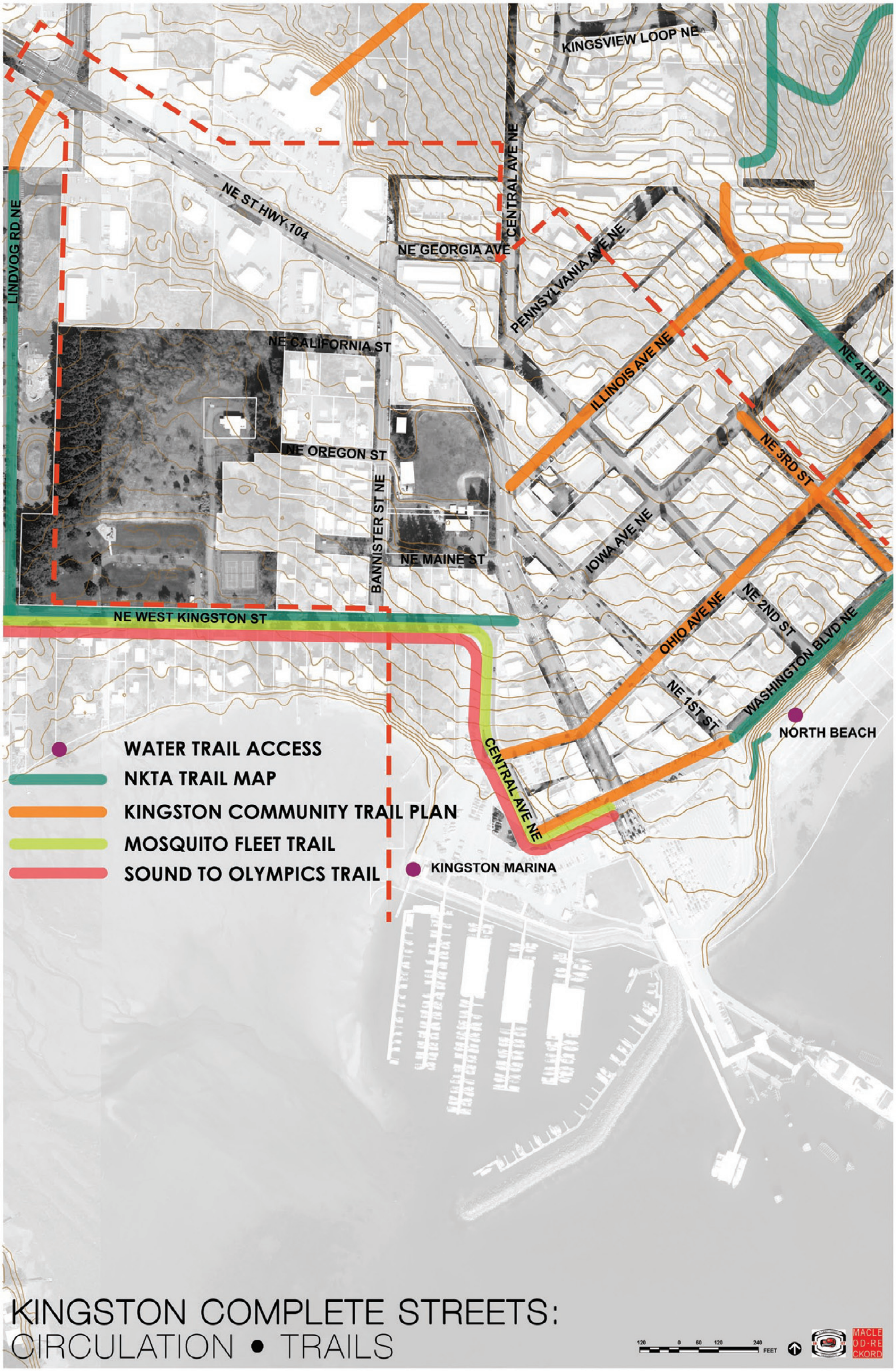


KINGSTON COMPLETE STREETS:
CATCHMENT AREAS

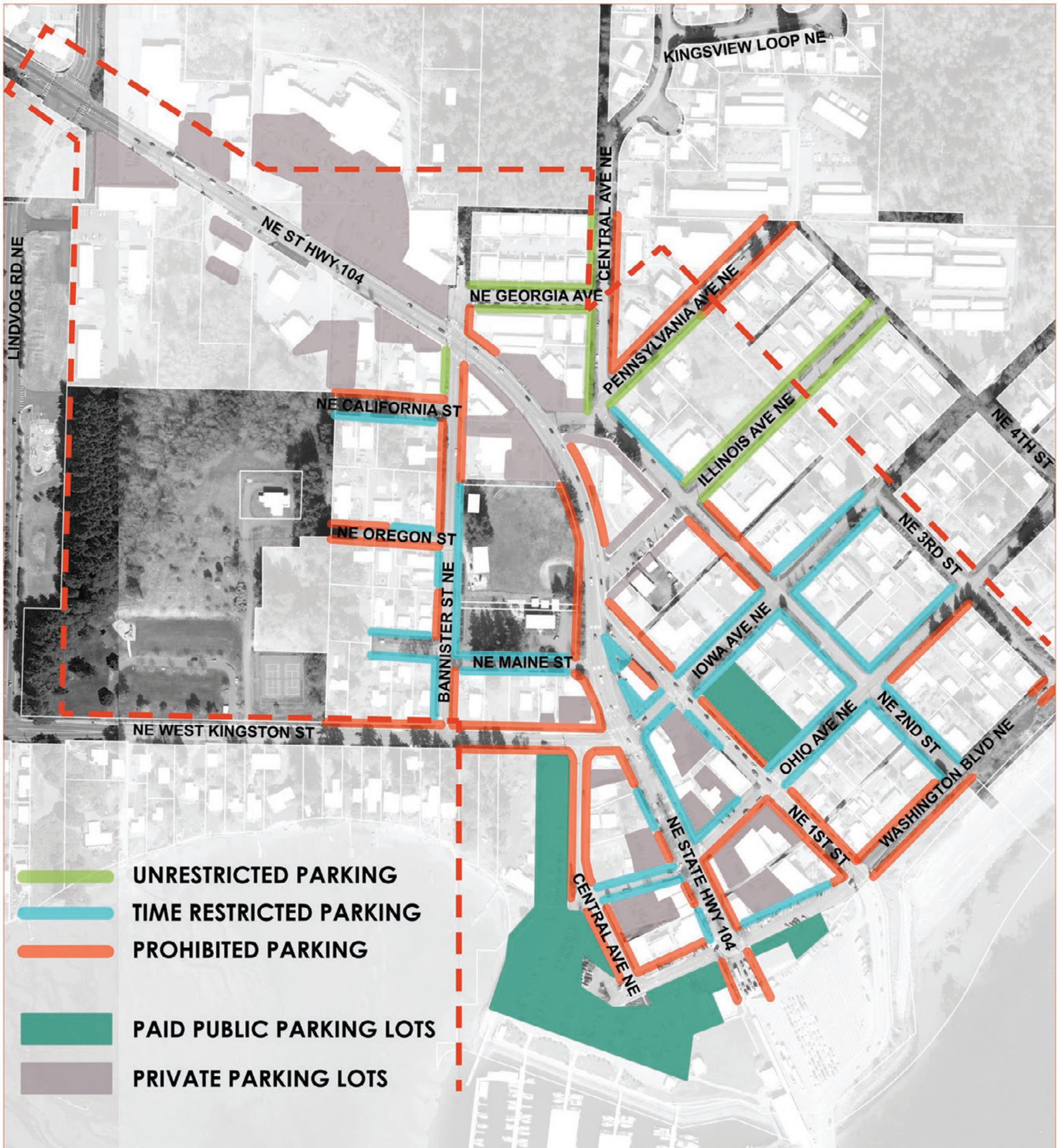
MACLEOD RECKORD



KINGSTON COMPLETE STREETS:
CIRCULATION • BIKE & SIDEWALK



KINGSTON COMPLETE STREETS:
CIRCULATION • TRAILS



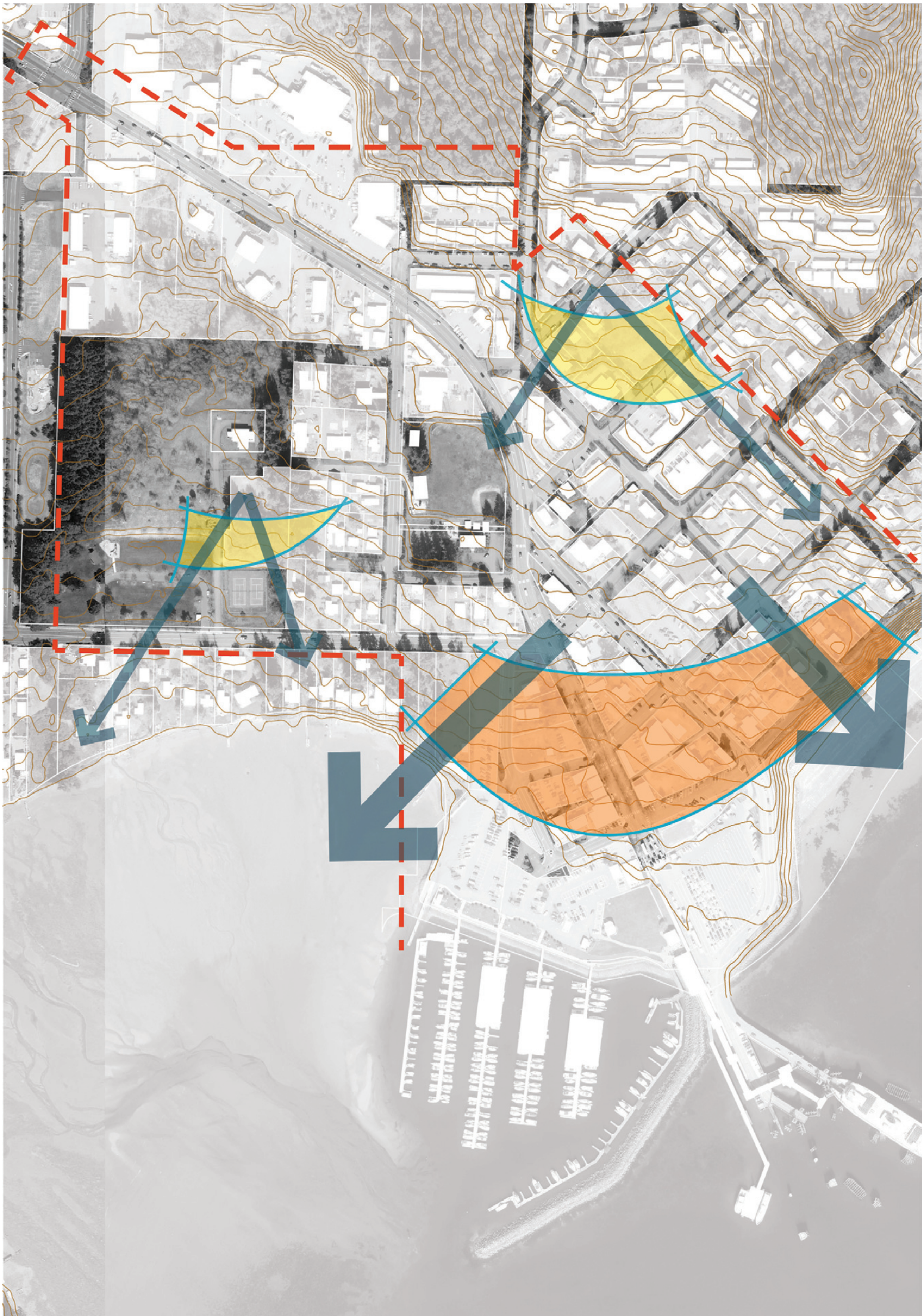
Existing Parking Supply and Utilization in Downtown Kingston

	Capacity (spaces)	Off-peak Season Midday		Peak Season Midday		Saturday Farmer's Market		Saturday Concert	
		#Veh Parked	Utilization	#Veh Parked	Utilization	#Veh Parked	Utilization	#Veh Parked	Utilization
Paid Lots									
WSDOT Lot	72	25	35%	34	47%	45	63%	42	58%
Port of Kingston Lot	328	122	37%	166	51%	301	92%	275	84%
Washington Blvd Lot	32	19	59%	22	69%	20	63%	19	59%
On-Street Parking									
Time-restricted	204	27	13%	20	10%	31	15%	36	18%
Unrestricted	90	27	30%	30	33%	27	30%	27	30%
Illegally parked	-	1		0		0			
TOTAL	726	221	30%	272	37%	424	58%	399	55%

Updated July 2015

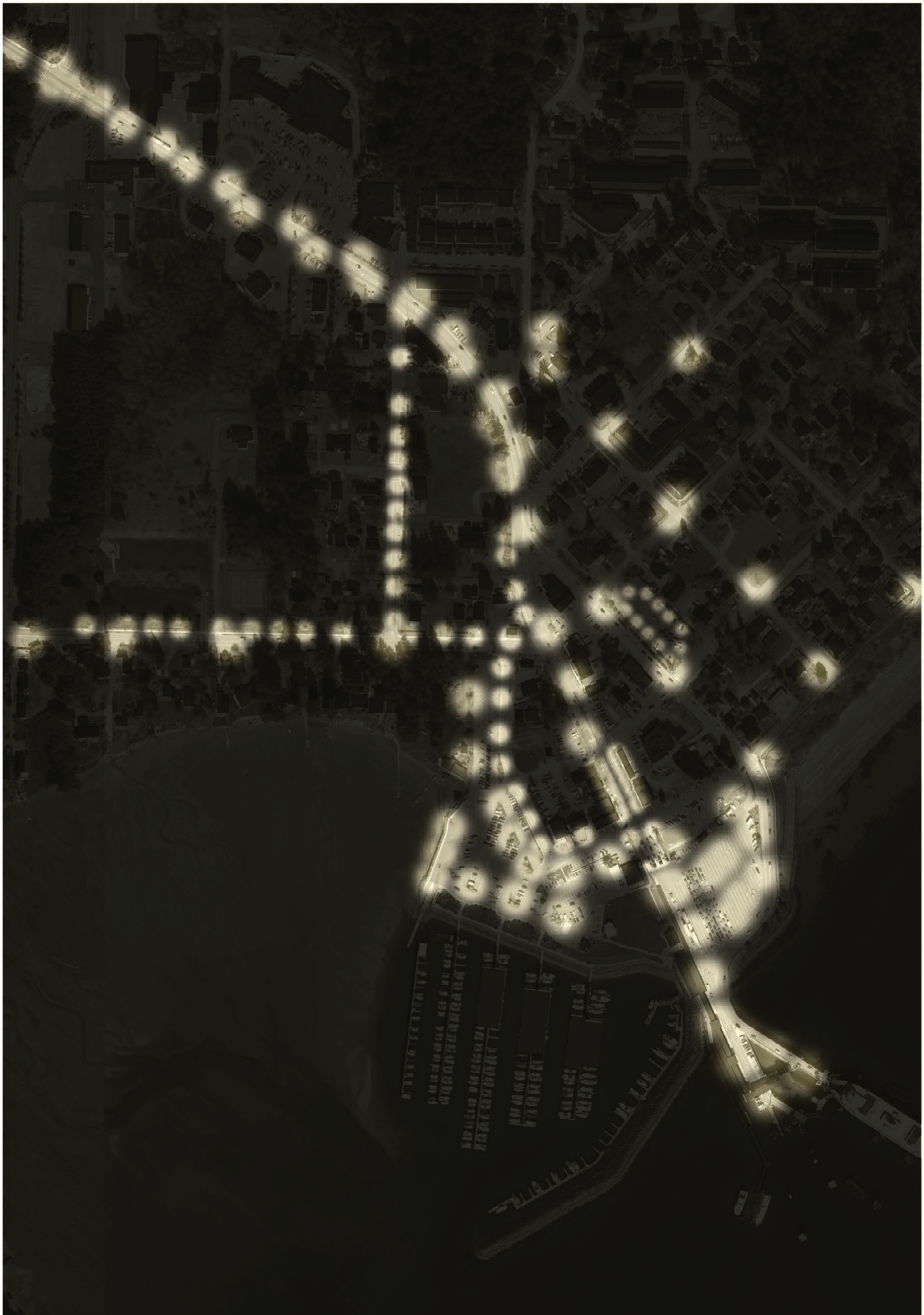
KINGSTON COMPLETE STREETS:
PARKING

120 0 60 120 240 FEET



KINGSTON COMPLETE STREETS:

VIEWSHED ANALYSIS

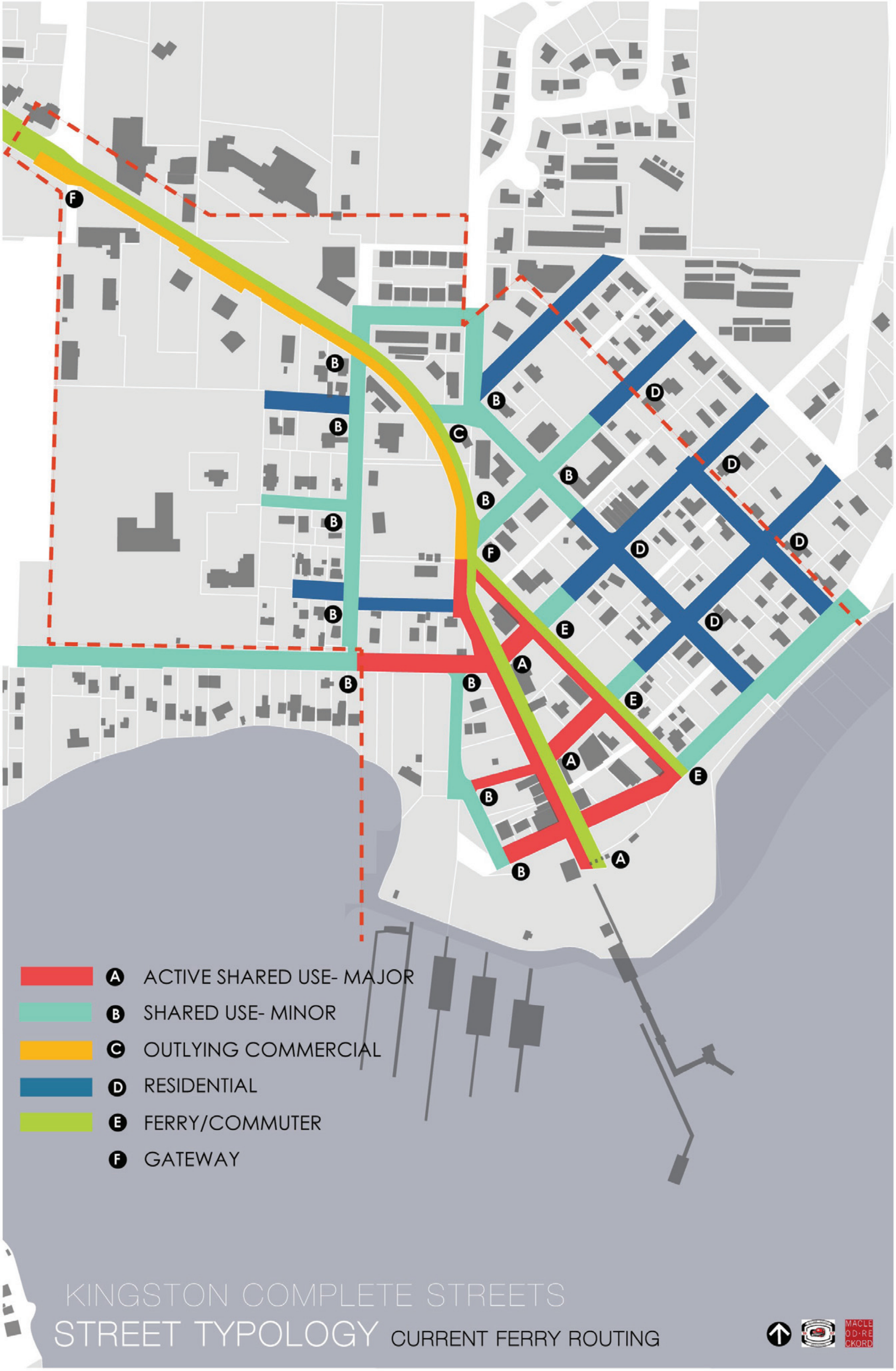


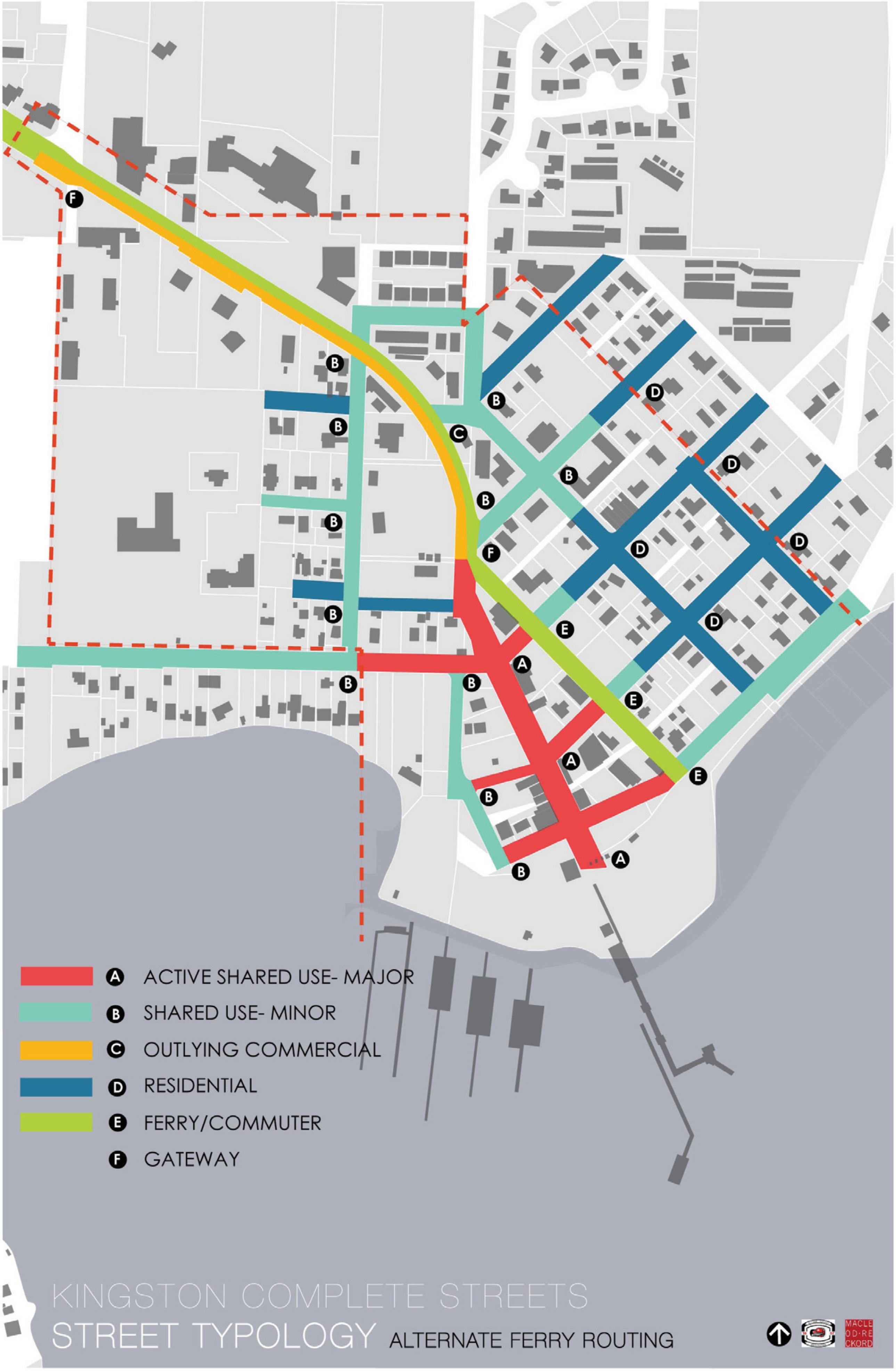
KINGSTON COMPLETE STREETS:

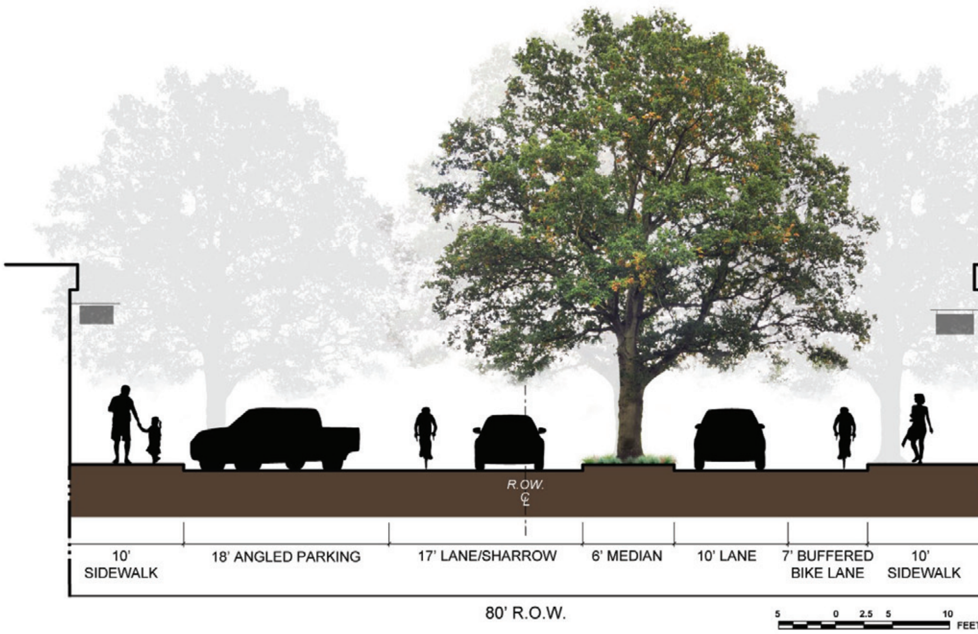
LIGHTING

KINGSTON COMPLETE STREETS:
UNDERUTILIZED PROPERTIES

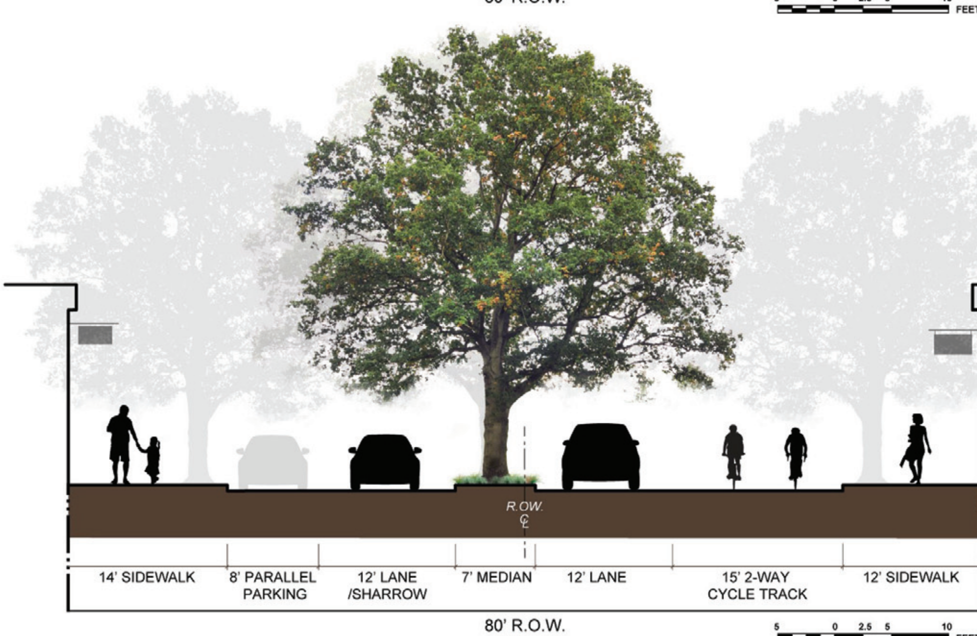
120 0 60 120 240 FEET


A ACTIVE SHARED USE- MAJOR
B SHARED USE- MINOR
C OUTLYING COMMERCIAL
D RESIDENTIAL
E FERRY/COMMUTER
F GATEWAY
A
B
C
D
E
F
KINGSTON COMPLETE STREETS
STREET TYPOLOGY CURRENT FERRY ROUTING
MACLEOD-RECKORD


A ACTIVE SHARED USE- MAJOR
B SHARED USE- MINOR
C OUTLYING COMMERCIAL
D RESIDENTIAL
E FERRY/COMMUTER
F GATEWAY
KINGSTON COMPLETE STREETS
STREET TYPOLOGY ALTERNATE FERRY ROUTING
MACLEOD-RECKORD



MAIN STREET
OPTION A

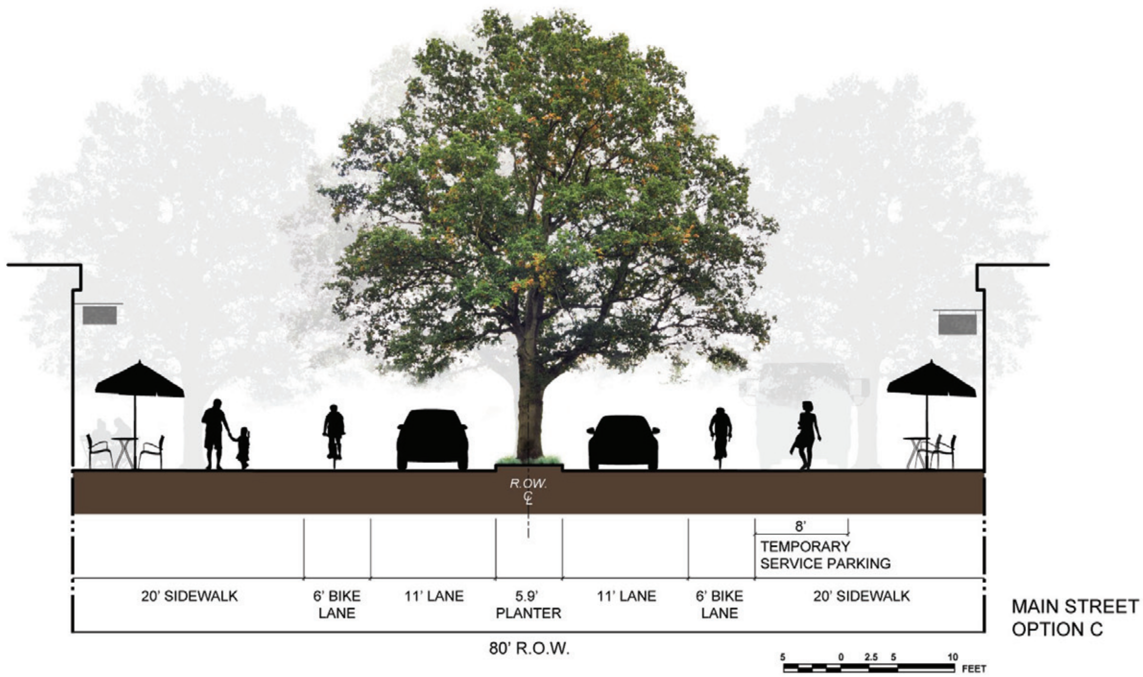


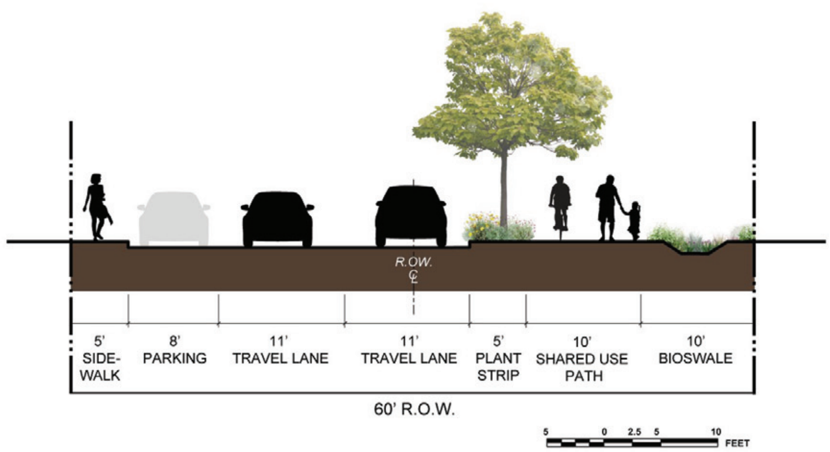
MAIN STREET
OPTION B

KINGSTON COMPLETE STREETS

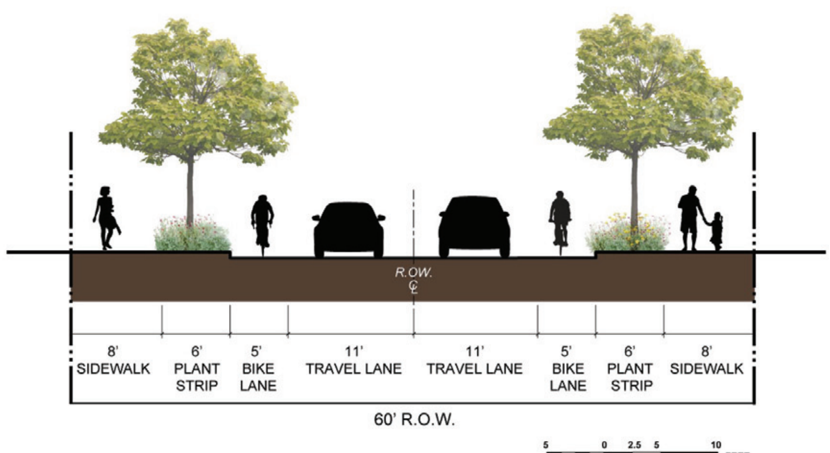
SECTIONS: ACTIVE SHARED USE MAJOR

MACLE
OD·RE
CKORD


R.OW.
8'
TEMPORARY
SERVICE PARKING
20' SIDEWALK
6' BIKE
LANE
11' LANE
5.9'
PLANTER
11' LANE
6' BIKE
LANE
20' SIDEWALK
MAIN STREET
OPTION C
80' R.O.W.
5 0 2.5 5 10
FEET

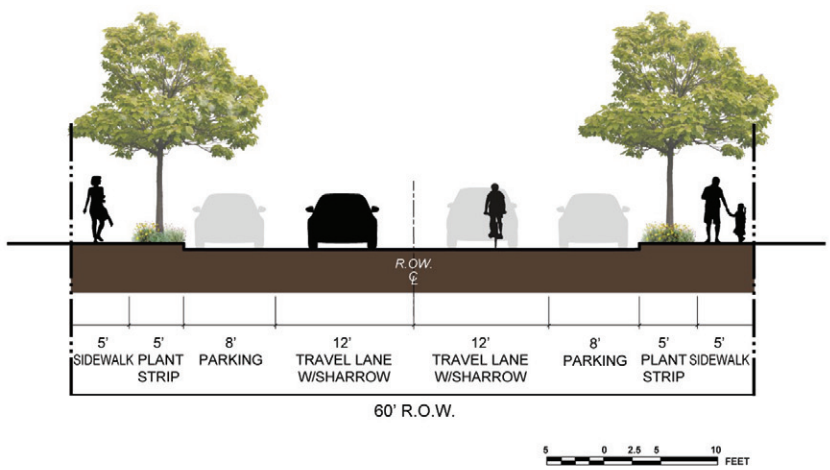


OPTION A
SHARED USE PATH

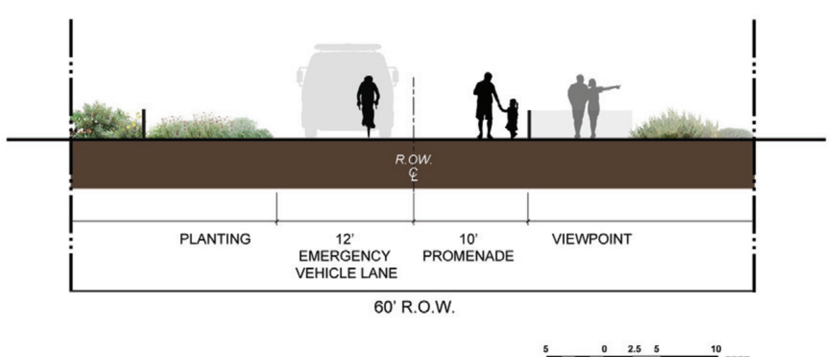


OPTION B
BIKE LANES
WITH NO PARKING

KINGSTON COMPLETE STREETS
SECTIONS: SHARED USE MINOR



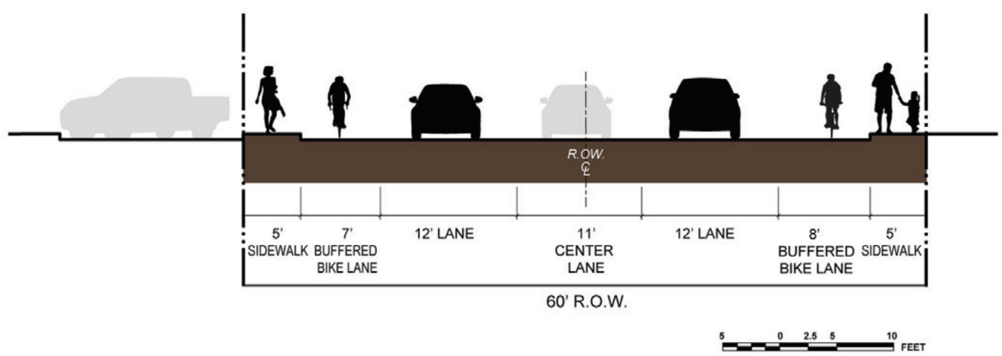
OPTION C
SHARROW



OPTION D
SHARED SPACE

KINGSTON COMPLETE STREETS
SECTIONS: SHARED USE MINOR

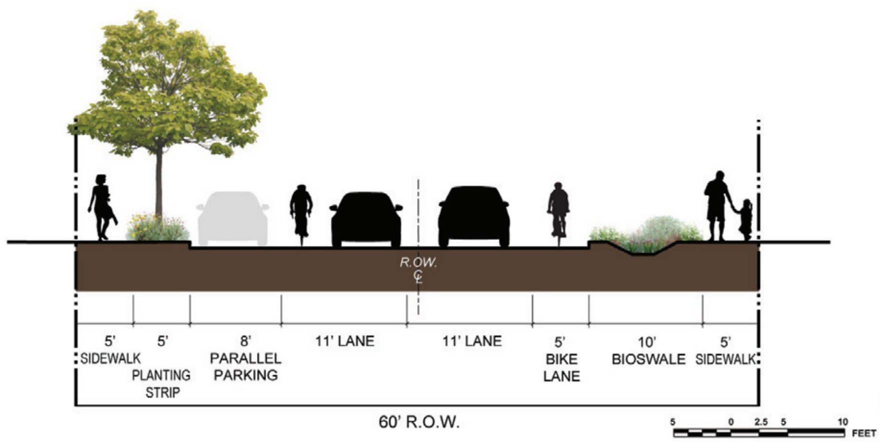
MACLE
OD-RE
CKORD



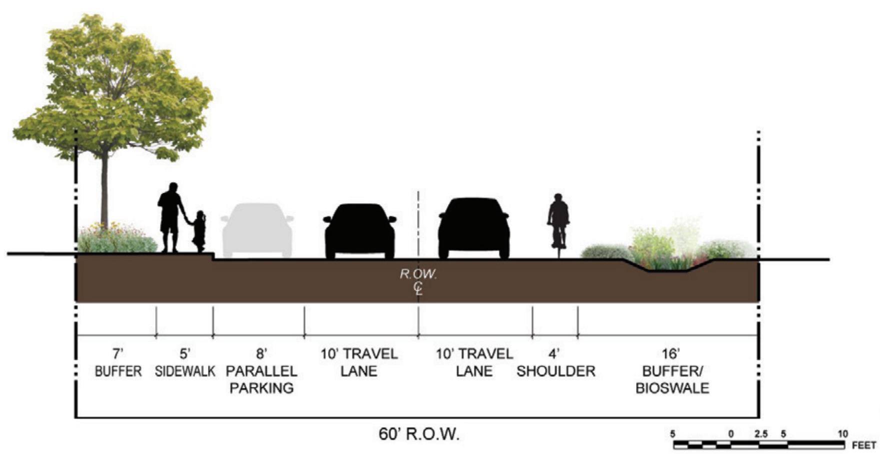
KINGSTON COMPLETE STREETS

SECTIONS: OUTLYING COMMERCIAL

MACLE OD·RE CKORD



OPTION A

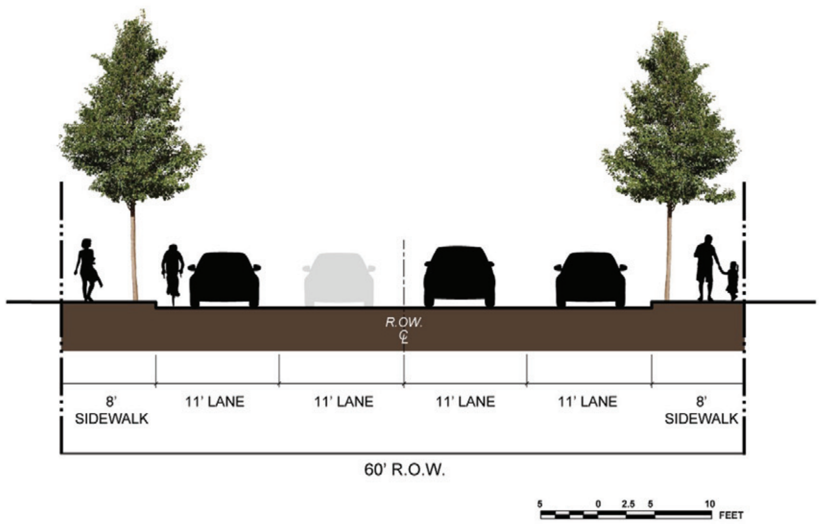


OPTION B

KINGSTON COMPLETE STREETS

SECTIONS: RESIDENTIAL

MACLE
OD·RE
CKORD



KINGSTON COMPLETE STREETS
SECTIONS: FERRY/COMMUTER


SR 104
1A
1B
14
NE GEORGIA AVE
NE CENTRAL AVE
NE PENNSYLVANIA AVE
13
NE CALIFORNIA ST
15
17
ILLINOIS AVE NE
10
12
NE OREGON ST
19
20
11
NE MAINE ST
BANNISTER ST NE
IOWA AVE NE
18
OHIO AVE NE
NE 3RD ST
16
NE 2ND ST
WASHINGTON BLVD
NE WEST KINGSTON RD
9
2A
2B
CENTRAL AVE NE
1A
1B
8
NE 1ST ST
6
MAIN ST
OHIO AVE NE
7
3A
3B
4A
4B
5B
KINGSTON COMPLETE STREETS
PROJECTS WITH AND W/OUT FERRY CHANGE
MACLEOD-RECKORD

Appendix B.2. Transportation

TRANSPORTATION REPORT

KINGSTON COMPLETE STREETS PROJECT

PREPARED FOR:

MACLEOD RECKORD

PREPARED BY:

heffron
transportation, inc.
6544 NE 61st Street, Seattle WA 98115
ph: (206) 523-3939 • fx: (206) 523-4949

MAY 11, 2016

TABLE OF CONTENTS

1. INTRODUCTION 1

2. EXISTING CONDITIONS 3
   2.1. Roadway Network 3
   2.2. Ferry Operation 4
   2.3. Vehicle Volumes and Operations 7
   2.4. Transit 10
   2.5. Non-Motorized Transportation 11
   2.6. Freight 14
   2.7. Parking 14
   2.8. Collision History 17

3. OVERVIEW OF COMPLETE STREETS PLAN 18

4. CONDITIONS WITH PROJECT ELEMENTS 21
   4.1. Ferry Access and Egress 21
   4.2. Vehicle Operations 21
   4.3. Transit 27
   4.4. Non-Motorized 27
   4.5. Parking 29

5. TRANSPORTATION POLICY REVIEW 30
   5.1. Washington State 30
   5.2. Puget Sound Regional Council 32
   5.3. Kitsap County 32

6. CONCLUSIONS 33

APPENDIX A – Level of Service Definitions

FIGURES

Figure 1. Kingston Complete Streets Project Study Area 2
Figure 2. Travel Mode Shares for Ferry Riders to/from Kingston 6
Figure 3. Two-Way Hourly Vehicle Volumes on SR 104 – Peak Season 8
Figure 4. Hourly Volumes per Direction on SR 104 – Saturday (Peak Day, Peak Season) 8
Figure 5. Non-Motorized Existing Facilities 12
Figure 6. Kingston/Edmonds Ferry Walk-On Passengers – Week Starting August 21, 2015 13
Figure 7. Existing Parking Characteristics 15
Figure 8. Traffic Signal Option for Reconfigured SR 104 (Alternative B, Option 1) 19
Figure 9. Roundabout Option for Reconfigured SR 104 (Alternative B, Option 2) 20
Figure 10. Peak Condition Analysis Volumes for Reconfigured SR 104 (Alternative B) 23
Figure 11. Non-Motorized Network with Implementation of Complete Streets Projects 28

TABLES

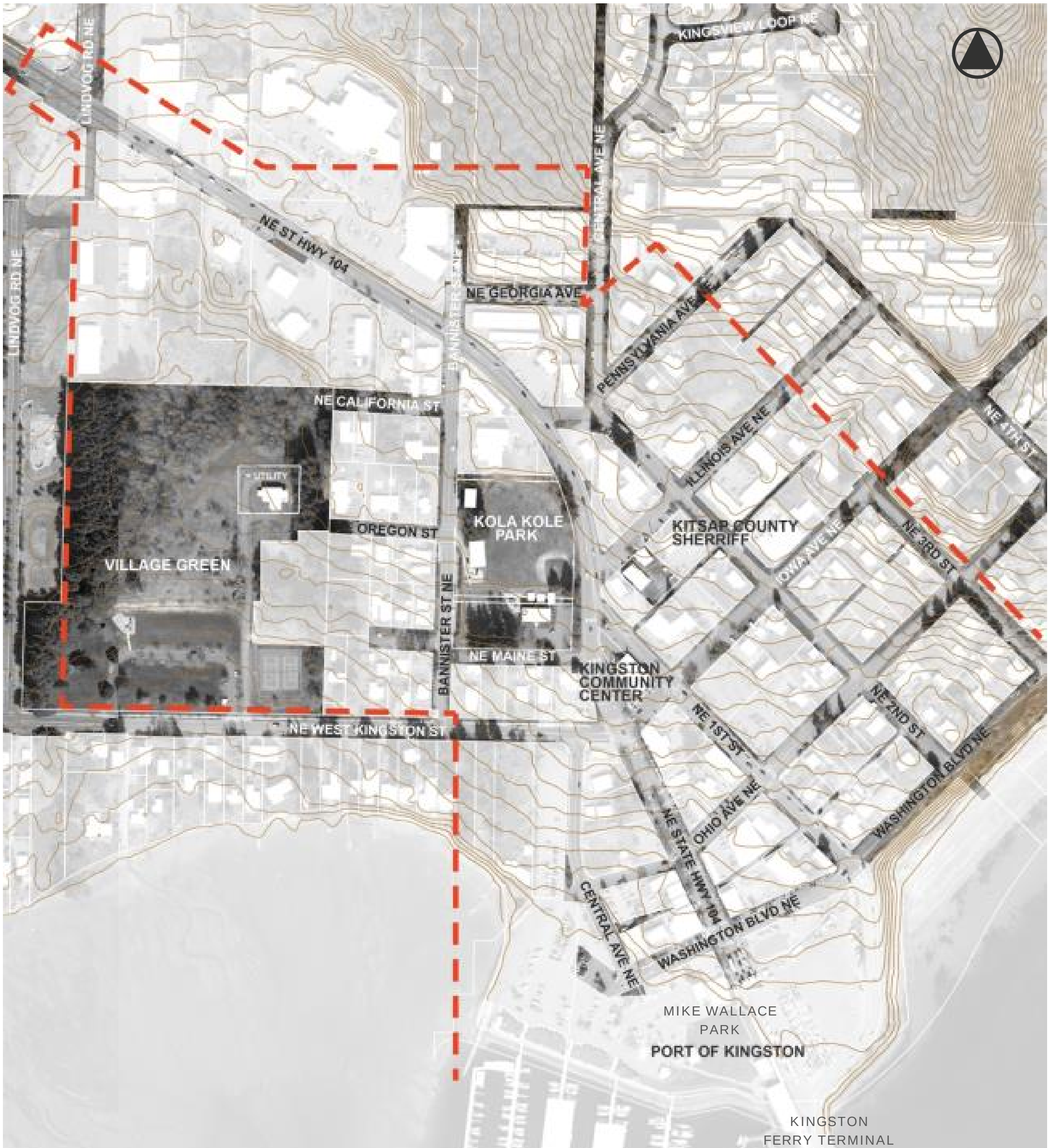
Table 1. Existing Transit Service 10
Table 2. Existing Public Parking Supply and Utilization 16
Table 3. Historical Collision Summary 17
Table 4. Level of Service at NE 1st Street/Iowa Avenue NE with Signal Option 25
Table 5. Level of Service at Main Street/NE West Kingston Road/Iowa Avenue NE 25
Table 6. Queueing on Iowa Avenue NE with Signal Option 26
Table 7. Public Parking Supply and Peak Utilization – With and Without Project 29

1. INTRODUCTION

The purpose of this report is to evaluate the existing transportation conditions in downtown Kingston, Kitsap County, and to assess the potential effect that the proposed Kingston Complete Streets Project would have on mobility and safety within and through the area. As a regional urban center, Kingston plays a pivotal role in north Kitsap County. The community retains a small town character, with a downtown core made up of a mix of shops, offices, parks, and multifamily residential, surrounded primarily by single-family residential. However, Kingston also serves as a regional transportation gateway, with State Route (SR) 104 serving as the primary arterial through town. With access to the Kingston/ Edmonds ferry route provided at the Kingston Terminal, SR 104 is a major regional connection between north Kitsap County and the region to the east of Puget Sound. The Kingston Complete Streets Project identifies a variety of projects to improve local pedestrian and bicycle access and travel within downtown Kingston, while still accommodating the substantial automobile and truck traffic that travels through the area via SR 104. In addition, improvements to transit and non-motorized facilities help increase usage of these modes, supporting local, regional and state policies to encourage active transportation and choices of travel modes alternative to the single-occupant vehicle (SOV).To implement any transportation improvements on SR 104, Kitsap County (County) will need to coordinate closely with the Washington State Department of Transportation (WSDOT), which has jurisdiction of the roadway.

Figure 1 shows the transportation study area, which includes downtown Kingston and nearby residential neighborhoods. It is generally bounded by Lindvog Road NE to the west (although the road itself is not included in the study area), SR 104/NE Georgia Avenue/NE Pennsylvania Avenue to the north, NE 3rd Street to the east, and the Puget Sound waterfront to the south.

Figure 1. Kingston Complete Streets Project Study Area



Source: MacLeod Reckord, 2015.

2. EXISTING CONDITIONS

2.1. Roadway Network

The study area includes the following arterial roadways. Roadway functional classifications were obtained from the WSDOT functional classification map for Kitsap County.[1]

SR 104 is a principal arterial that provides regional access for Kingston and the rest of north Kitsap County, connecting to SR 99 and I-5 in Snohomish County to the east (via the Kingston/ Edmonds ferry route), and to the Hood Canal Bridge and US-101 in the northern Olympic Peninsula to the west. Although SR 104 is has a northwest-southeast orientation in Kingston, for the purposes of this report, the direction away from the ferry terminal is characterized as westbound (SR 104 west) and the direction toward the ferry terminal is characterized as eastbound (SR 104 east).

To the north of Illinois Avenue NE, SR 104 is three lanes wide, with one general-purpose lane in each direction and a center two-way left-turn lane. Between the downtown area and the north end of Kola Kole Park, it has sidewalk along the west side (along the park) and shoulder on the east side. North of the park it has shoulders on both sides. This segment of SR 104 has a high density of driveways, and much of the shoulder in the eastbound direction has painted striping and signage prohibiting queued vehicles waiting for ferry access from blocking the driveways. This segment of SR 104 has signalized intersections at Lindvog Road NE and Bannister Street NE, with marked crosswalks and pedestrian signals on all intersection legs. A marked pedestrian crossing is also provided midway between these two intersections, near the Kingston Food Market shopping center.

To the south of Illinois Avenue NE in the downtown core, SR 104 divides into a couplet. The eastbound SR 104 segment is also called Main Street and fronts Kingston downtown development. At its north end it is three lanes wide, with the inside lane identified for ferry traffic and each outside lane identified for local traffic. To the south of NE West Kingston Road/NE Iowa Avenue, the inside lane divides into two ferry lanes (for a total width of four lanes) with a narrow landscaped median in-between; these lanes lead to the toll booths at the ferry terminal. This segment of SR 104 has sidewalks, curbs, and gutters along both sides. It has marked crosswalks on all legs of its intersections with NE West Kingston Road/Iowa Avenue NE, Ohio Avenue NE, and Washington Boulevard NE, and a mid-block crosswalk between NE West Kingston Road/Iowa Avenue NE and Ohio Avenue NE.

The westbound segment of the SR 104 Couplet is also called NE 1st Street. Between the ferry dock and Ohio Avenue NE it is two lanes wide; these merge into one lane between Ohio Avenue NE and Iowa Avenue NE before the couplet merges back into the two-way mainline. This segment has narrow shoulders on each side, and marked crosswalks at its intersections with Iowa Avenue NE, Ohio Avenue NE, and Washington Boulevard NE. While this segment serves all outbound (westbound) ferry traffic, it also provides access for local commercial development along its west side and residential development to the east. A traffic signal at Washington Boulevard NE primarily serves to regulate the flow of outbound ferry traffic, but it also provides a protected crossing for pedestrians and vehicles accessing SR 104 from eastbound Washington Boulevard NE.

---

1 Washington Department of Transportation, 2004. Functional Classification of Public Roads: Kitsap County. September 9.

SR 104 (including surface highway and cross-sound ferry route) is a designated Highway of Statewide Significance.[2] Codified in the *Revised Code of Washington* (RCW) Chapter 47.06.140, Highways of Statewide Significance are those highways and other transportation facilities needed to promote and maintain significant statewide travel and economic linkages in Washington State. The legislation emphasizes that these significant facilities should be planned from a statewide perspective, and they are not subject to local standards. Planning for Highways of Statewide Significance is led by the state, so any proposed changes to SR 104 must be closely coordinated with WSDOT.

NE West Kingston Road is a collector arterial that connects Kingston to other north county communities to the west and south such as Indianola and Suquamish. In the project study area, it is two lanes wide with an east-west orientation. It has a sidewalk on the north side (including along the Village Green Park) and painted bicycle lanes along both sides.

Washington Boulevard NE is designated as a collector arterial between the SR 104 mainline (Main Street) and Central Avenue NE. This segment is a one-lane one-way westbound street that primarily serves to connect vehicles in the south downtown area to the Port of Kingston parking lot, and also to outbound SR 104 via Central Avenue NE.

Central Avenue NE is also a collector arterial, connecting Washington Boulevard NE and SR 104. It is two lanes wide, with the southbound lane dropping to a right-turn-only lane into the Port of Kingston parking lot at Washington Boulevard NE. It has a sidewalk along its west side, and painted bicycle lanes along both sides.

All other streets in the project study area are local access streets, meaning that their primary function is to provide access to adjacent commercial and residential development. Local access streets have one travel lane in each direction, with a speed limit of 25 miles per hour (mph) unless otherwise signed; they typically carry lower vehicle volumes than arterial streets. The study area local access streets have varying non-motorized and parking characteristics, which are described later in this report.

2.2. Ferry Operation

The Kingston Ferry Terminal, serving the Kingston/Edmonds route, is the largest traffic generator in the study area. Ferry service is an integral part of the County's transportation system, with four Washington State Ferry (WSF) routes connecting Kitsap County and the east Puget Sound area. Total riders (vehicle and passenger) on the four Kitsap routes— Kingston/Edmonds, Bainbridge Island/Seattle, Bremerton/Seattle, and Southworth/Vashon/Fauntleroy—comprised about 62% of total ferry system ridership in 2015.[3] Of these Kitsap routes, the Kingston/Edmonds route's total annual ridership of 4.1 million passengers was second only to the Bainbridge Island/Seattle route. However, the Bainbridge Island/Seattle route carries a high number of walk-on passengers, and the 2.1 million annual vehicles carried on the Kingston/Edmonds route was the highest of the Kitsap routes (and second highest system-wide, slightly behind the Mukilteo/Clinton route).

The Kingston/Edmonds route is the northernmost of the four Kitsap routes. It takes about 30 minutes for the ferry to cross approximately 4.5 nautical miles. The route is in service all days of the week. Currently, the Kingston/Edmonds route operates 21 to 26 sailings per day in each direction during the peak season, and 21 to 24 sailings per day in each direction during the off-peak season. Total sailings per day vary, with more frequent sailings scheduled during peak demand times. However, it should be noted that

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2 Washington State Department of Transportation (WSDOT), 2009. Transportation Commission List of Highways of Statewide Significance.

3 Washington State Ferries (WSF), 2016a. Traffic Statistics Rider Segment Report, January 1 through December 31, 2015.

the level of ferry service is dependent upon available vessels and funding, and can change from year to year. Time between departures is typically 40 to 50 minutes, with frequencies extending to 60 to 90 minutes later at night. During peak demand periods the Kingston/Edmonds route is typically served by Jumbo class ferries, which are the second largest in the WSF fleet with a vehicle capacity of 188 and passenger capacity of 2,000. (The largest vessel, the Jumbo Mark II, has a vehicle capacity only of 202, only 14 higher than the Jumbo, but has a passenger capacity of 2,499). The route is also sometimes served by Olympic class vessels, which have a vehicle capacity of 144 and passenger capacity of 1,500.[4]

In 2013, WSF conducted a detailed travel survey of its passengers.[5] As shown on Figure 2, the survey results indicated that the vast majority of riders access the Kingston/Edmonds ferry by vehicle. The figure shows that about 93% of weekday riders were in a vehicle that drove on to the ferry, and an additional 2% were dropped off or picked up by vehicle at the terminal. The remaining 5% either walked or biked onto the ferry (including those who accessed the ferry by public transit bus during the weekday). On Saturday, the percentages of riders who access and egress by vehicle were slightly higher, but it should be noted that overall ridership is generally higher on weekends, so the numbers of weekend walk-on passengers can actually be higher than on weekdays (described in more detail in the *Non-Motorized Facilities* section later in this report). Average vehicle occupancy (AVO) for vehicles driving onto the ferry was 1.44 persons per vehicle on the weekday and 1.93 on Saturday. The survey results also indicated that a large share of Kingston/Edmonds walk-on passengers (about 71% on the weekday and 64% on Saturday, combined for both directions) drove and parked their cars near the terminals, so they also contribute to vehicle traffic in the area. The travel survey data indicated that on the weekday, about 51% of ferry riders are commuting to work or school and 49% are traveling for personal business, recreation, shopping or other purposes. On Saturday, only about 7% of riders are commuters, with the remaining 93% traveling for the other purposes

Two major considerations emerge from the WSF survey results with regard to the Kingston Complete Streets project. First, the data show that the vehicle demand generated by the Kingston/Edmonds ferry is significant. This is due to relatively lower land use densities at both ends of the ferry route (compared, say, to the two routes that directly serve downtown Seattle) as well as the function of the route to provide regional access for the entire north Kitsap County. The predominance of vehicle use is expected to continue into the foreseeable future, even with measures to encourage increased use of alternative travel modes. Therefore, transportation improvements in the Kingston area must be developed in a way that continues to recognize this substantial vehicle demand.

Second, and just as important, the data illustrate the significant challenges faced by pedestrians and bicyclists in downtown Kingston. Whether they are walk-on/bike-on ferry passengers, bus riders walking to or from bus stops, park-and-ride users walking to or from the ferry terminal, or community members and visitors living, working, shopping or recreating in the area, vehicle traffic generated by the ferries—with surges occurring once or twice per hour in each direction—is a dominant element in Kingston, and serves as a major impediment to sustaining a walkable and bikable community.

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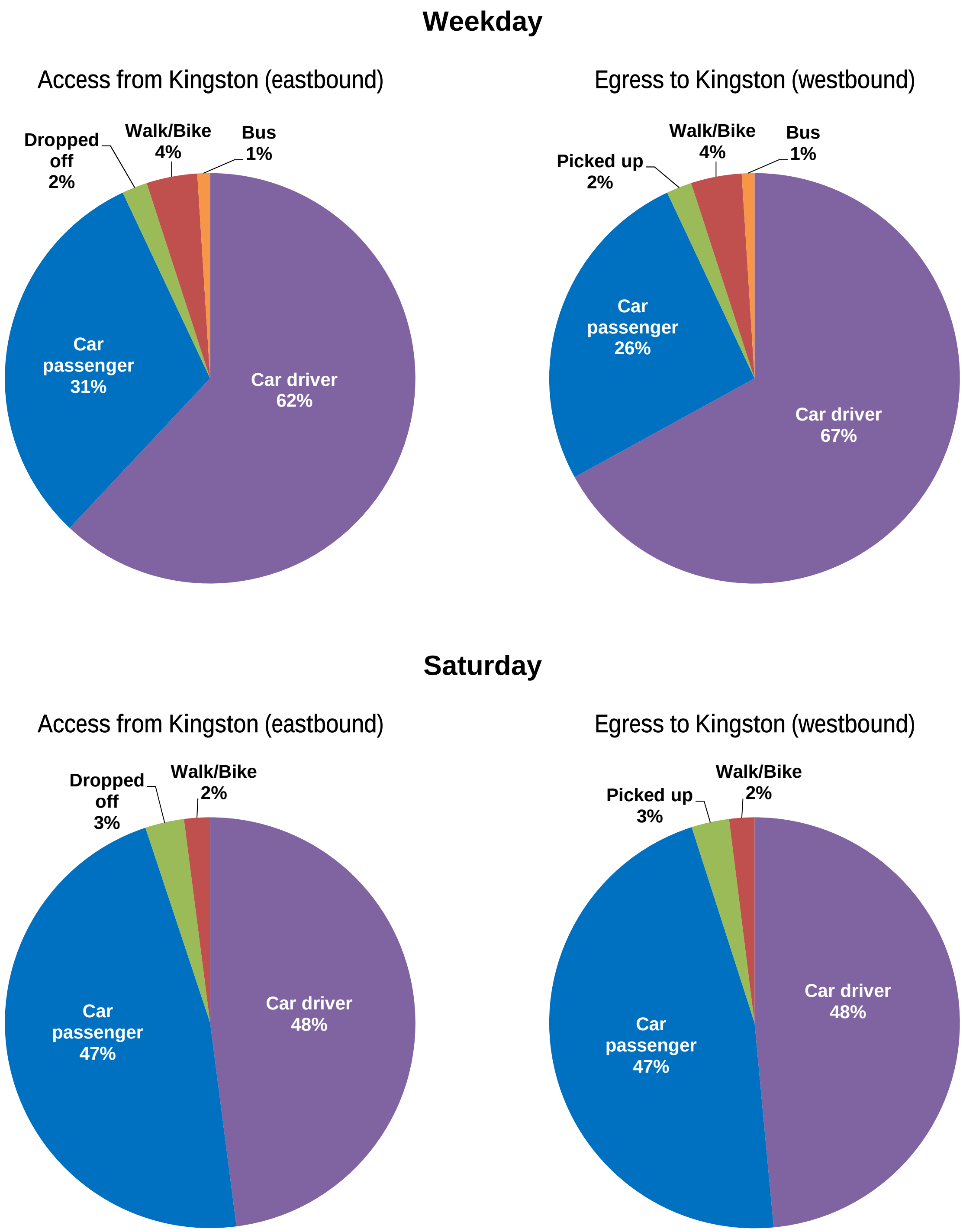
4 Washington State Ferries (WSF), 2016. Vessel descriptions by class. www.wsdot.wa.gov/ferries/vesselwatch/Vessels.aspx, Accessed January 2016.

5 Washington State Ferries (WSF), 2014. 2013 Origin-Destination Travel Survey Report, August.

Figure 2. Travel Mode Shares for Ferry Riders to/from Kingston



Source: WSF, 2014

WSF has implemented a vehicle reservation system on its Port Townsend/Coupeville and Anacortes/ San Juan routes, by which vehicle travelers may reserve space on a particular sailing up to two months in advance. The reservation system helps reduce vehicle queues by allowing ferry riders to arrive at the terminal closer to their desired departure time. Extending the reservation system to other WSF routes is currently under study, but while overall vehicle queues can be reduced with an effective reservation system, there are unique queuing challenges associated with accommodating both reservation vehicles and standby vehicles; these have not yet been resolved for Kingston/Edmonds and neither an implementation plan nor year of opening has yet been determined for a reservation system on this route. The County and WSF coordinate closely on any potential changes that affect ferry-generated traffic in Kingston, and would continue to do so in order integrate complete streets improvements with any proposed future changes associated with a reservation system. However, analysis presented in this report assumes conditions without a ferry reservation system, which should reflect a more conservative condition with higher hourly traffic volumes generated by the ferry.

2.3. Vehicle Volumes and Operations

2.3.1. SR 104 Mainline

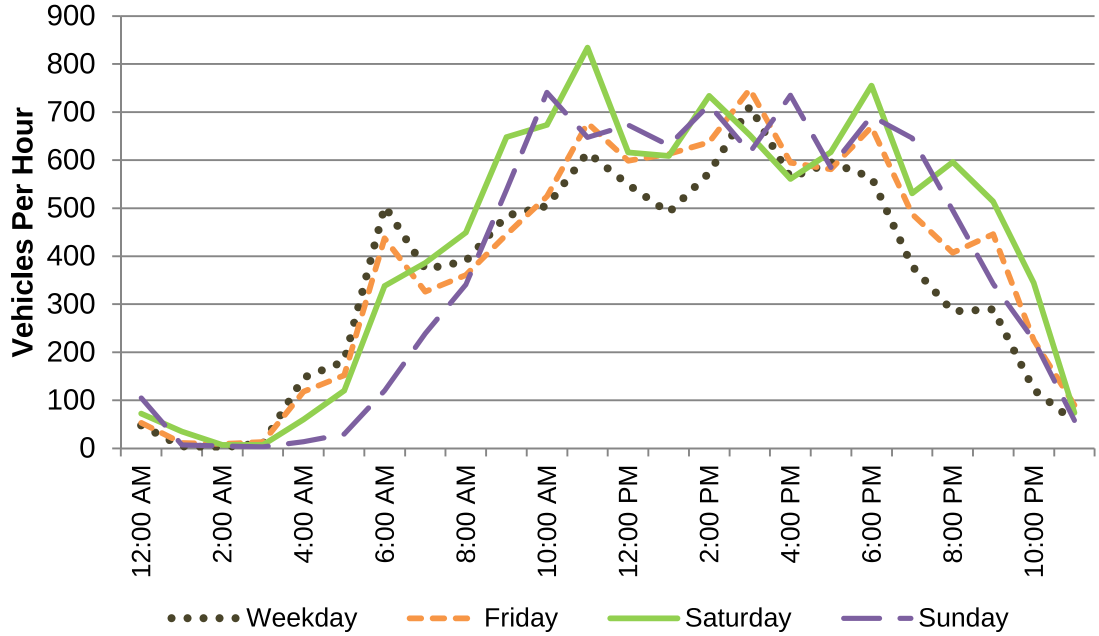
Two-way traffic counts were conducted on SR 104, just north of Illinois Avenue NE, for the week starting Friday, August 21, 2015. This period reflects typical summer (peak season) conditions for ferry ridership and tourist activity, and the Saturday count also reflects conditions with the daytime Kingston Farmers' Market and evening free concert that are regularly held at Mike Wallace Park during the summer months. A summary of the counts is shown on Figure 3. It is noted that holidays or special events could generate higher daily ferry trips. However, this increased demand tends to have a greater effect on the lengths of ferry queues than on the hourly vehicle volumes traveling through Kingston. This is because the rate of traffic flow is constrained by the vehicle capacity of the ferry vessels. Periods of higher ferry demand are typically characterized by expansion of peak conditions across more hours of the day, rather than pronounced increases in volumes for any one-hour period. Therefore, the typical peak season conditions provide a reasonable baseline for analysis.

The data indicate an average daily traffic (ADT) of 9,000, which reflects the average traffic for each day in the 7-day week. The average weekday daily traffic (AWDT) is 8,700, which reflects average volumes on Monday through Friday. The difference between these two values illustrates that the highest daily volumes occur on the weekend.

As shown on Figure 3, summer weekend traffic volumes range between 600 and 800 vehicles per hour during most hours of peak activity. Weekday volumes typically range between 500 and 700 vehicles per hour during most hours of peak activity. The highest hourly traffic volume occurred on Saturday between 11:00 a.m. and noon, with a total of 834 vehicles (468 westbound, and 366 eastbound). The highest weekday hourly traffic volume occurred on Thursday between 3:00 and 4:00 p.m., with a total of 761 vehicles (416 westbound, and 345 eastbound).

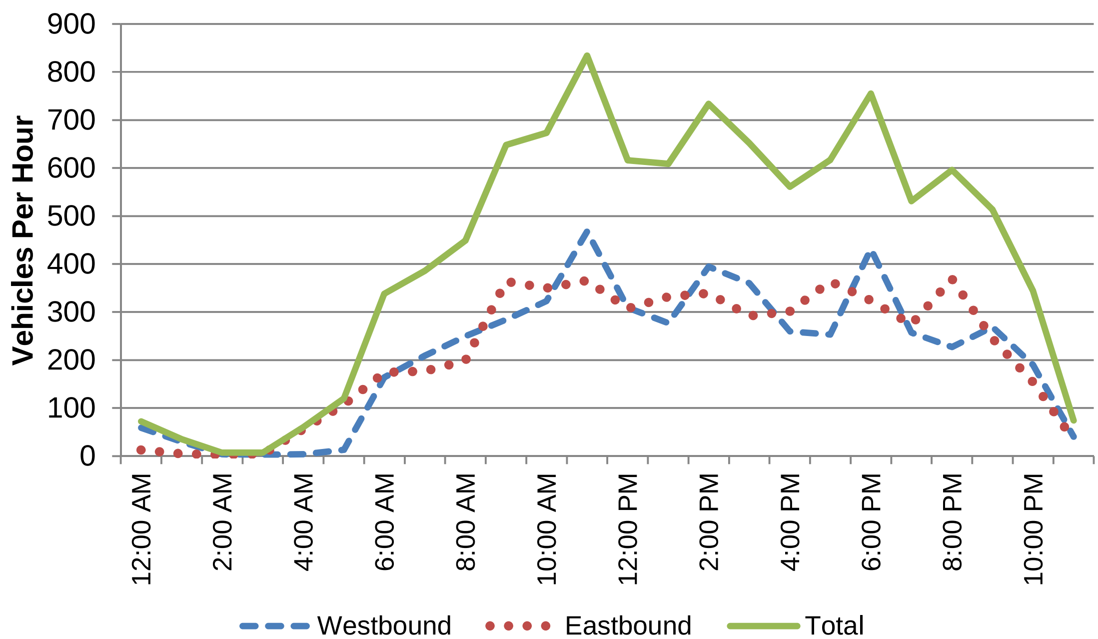
Hourly volumes per direction for Saturday—when the highest overall volumes were observed—are shown on Figure 4. The figure shows distinct peaks throughout each day in the westbound direction, which reflects the traffic surges that result from exiting vehicles when a ferry vessel arrives at the Kingston terminal. The eastbound traffic generally has less distinct peaks, reflecting a more spread-out pattern of vehicles arriving to board the ferry, with small surges occurring prior to the ferry departure times.

Figure 3. Two-Way Hourly Vehicle Volumes on SR 104 – Peak Season



Source: Idax Data Solutions, Heffron Transportation, 2015. Volumes reflect counts conducted for the week beginning Friday, August 21, 2015.

Figure 4. Hourly Volumes per Direction on SR 104 – Saturday (Peak Day, Peak Season)



Source: Idax Data Solutions, Heffron Transportation, 2015. Volumes reflect counts conducted on Saturday, August 22, 2015.

All ferry sailings during the week of the traffic counts were served by the Spokane and Walla Walla ferry boats. Both are Jumbo class vessels with the highest vehicle capacity (188 vehicles) that typically serves the Kingston/Edmonds route, though it should be noted that a vessel can carry more vehicles than its theoretical capacity if a higher proportion of smaller vehicles are on board.

During periods of high ferry demand such as summer weekends and holidays, Washington State Patrol (WSP) officers are enlisted to direct vehicle traffic in Kingston. In summer 2015, two officers were typically stationed on SR 104 during peak periods, with one near NE West Kingston Road and the other near Lindvog Road NE. As discussed previously, a high density of driveways between these two roadways leaves very little curb space to accommodate eastbound ferry queues along this portion of SR 104. In addition, the horizontal curve of SR 104 along this segment limits sight distance so that a driver at Lindvog Road NE cannot see the queuing condition at NE West Kingston Road and beyond. Without traffic management, even well-intentioned ferry-bound drivers may proceed past Lindvog Road NE unaware that ferry queues are backed up past NE West Kingston Road and blocking access to driveways, then adding to the blocking queues themselves. During peak periods when ferry queues extend beyond NE West Kingston Road, this is addressed by the upstream WSP officer holding the ferry queue at Lindvog Road NE, and communicating by radio with the downstream officer, releasing vehicles to join the downstream queue as capacity approaching the ferry toll booths becomes available. Reservation cards required for entrance onto the ferry dock are handed out to the vehicles queued upstream, to preclude drivers from illegally cutting in line downstream.

Field observation indicates that this approach is effective for managing peak condition ferry traffic, but it is dependent upon the availability of WSP officers. WSF requests officers for periods when peak demand is anticipated, and generally is accommodated by WSP when the requests are made. However, unique events or other circumstances can sometimes generate high demand that is not anticipated by WSF or WSP, resulting in uncontrolled ferry traffic during these times. Also, while officers have generally been provided when requested, it is a decision made entirely by WSP and not under the control of WSF. There is no guarantee that in the future, resource allocation decisions could not be made by WSP that would reduce or eliminate the officers made available to provide this role.

2.3.2. NE 1st Street

As described previously, a major function of NE 1st Street is as the exit roadway for ferry vehicle traffic, but it also provides access to the SR 104 mainline for local commercial development along its west side and residential development to the east. Traffic on this roadway generally consists of bursts of higher traffic volumes (generally lasting 10 minutes or less) associated with ferry arrivals, followed by lower volumes in between ferries, consistent with the westbound patterns shown on Figure 4.

The primary operational issue identified on this segment is related to the right merge of the two lanes exiting the ferry dock to one lane as the couplet approaches the mainline segment, combined with the left merge from the right lane for exiting drivers intending to turn left on to Ohio Avenue NE or Iowa Avenue NE. The distance between the ferry dock and Iowa Avenue NE (over 600 feet) should be sufficient to accommodate these merging and weaving maneuvers. However, a trend has been observed in which many drivers seek to weave to the opposite lane immediately upon exiting the ferry dock, substantially reducing the length of roadway along which these maneuvers primarily occur; this increases the potential for vehicle conflicts, and reduces the capacity of this section. Another consideration for traffic on this roadway segment is its effect on local traffic attempting to cross during the ferry surges. Currently, local residents and employees are generally familiar with the ferry schedules and know when these conditions generally occur, and often can choose alternate travel routes or times to avoid them. Additionally, the traffic signal at Washington Boulevard NE helps regulate the flow of exiting ferry traffic, creating gaps for vehicles and pedestrians crossing or entering from the intersecting local streets, as well as providing a signal-projected crossing. For these reasons, potential conflicts with local traffic is not identified as an existing major issue on NE 1st Street, but any proposed changes to channelization along this segment need to consider the effect on intersecting local vehicular and non-motorized traffic.

2.3.3. NE West Kingston Road

NE West Kingston Road also serves an important regional function, connecting Kingston to other north county destinations. The County has observed that as much as one-quarter of Kingston/Edmonds ferry traffic can travel to and from the ferry dock via NE West Kingston Road.[6] It will be important for any street channelization recommendations to take this demand into account, particularly the exiting ferry traffic that currently turns left from NE 1st Street to Iowa Avenue NE, crosses Main Street, and proceeds westbound on NE West Kingston Road. Inbound traffic destined to downtown Kingston or the ferry dock during non-peak conditions can turn right directly from NE West Kingston Road to Main Street. During peak ferry conditions, vehicles destined for the ferry from NE West Kingston Road must circle to the north (e.g. via Barber Cutoff Road NE) and join the ferry queue at the appropriate upstream location.

2.3.4. Local Kingston Streets

The other streets in the project study area primarily serve local traffic access and circulation. The primary challenges to vehicular traffic flow on these streets are those related to navigating around ferry generated traffic, as described in the previous sections.

2.4. Transit

Kitsap Transit bus routes 91 and 92 serve the Kingston area. As summarized in Table 1, bus service is currently provided only on weekdays. Buses schedules are generally are timed to correspond with the ferry schedule. The bus stop closest to the ferry terminal is located on Washington Boulevard NE between Main Street and 1st Avenue NE, about 550 feet walking distance from the end of the ferry pedestrian bridge. In years past, the bus stop was located in the ferry holding area, much closer to the pedestrian bridge, but buses had to mix with outbound vehicle traffic when exiting the holding area, which made it difficult to stay on schedule. Kitsap Transit moved the bus stop to its current location to improve schedule reliability. Bus stops are also located along SR 104 in the north portion of the study area, in the vicinity of Bannister Street NE, the Kingston Food Market shopping center, and Lindvog Road NE.

Table 1. Existing Transit Service

Route	Areas Served	Service Days, Hours	Typical Frequency (minutes)
91	Kingston, Suquamish, Bainbridge Island[1]	Monday thru Friday, ~4:30 A.M.–8:30 P.M.	50 – 60
92	Kingston, Suquamish, Poulsbo	Monday thru Friday, ~8:30 A.M.–5:00 P.M.	60

Source: Kitsap Transit, January 2016

1. Additional Route 91 service is provided between Indianola and Bainbridge Island, but these buses do not serve Kingston.

6 Kitsap County, 2008. Observed traffic patterns at SR 104/NE West Kingston Road, Kingston, WA.

Kitsap Transit is currently developing a business plan and long-range strategy for fast and reliable passenger-only ferry service connecting communities in Kitsap and King County. As part of this process, the agency conducted two online surveys in summer and fall of 2014 to better understand community priorities and interest in passenger-only ferry service. Kitsap Transit identified three route alternatives connecting Kitsap communities—Kingston, Bremerton and Southworth—to downtown Seattle, but this potential additional service is not currently funded.

2.5. Non-Motorized Transportation

In addition to ferry-generated pedestrians and bicyclists, locally-generated non-motorized traffic consists of Kingston residents and visitors who walk within and through the project study area. In addition to shops, restaurants, parks and community spaces that serve as the hubs of local activity, the Kingston community holds regular events that draw visitors and residents to the downtown and waterfront areas. The Kingston Farmer's Market is held each Saturday during the summer; a free concert is also held on most Saturday evenings during the summer. Vehicular and non-motorized traffic generated by both of these events are reflected in the Saturday counts presented in this report.

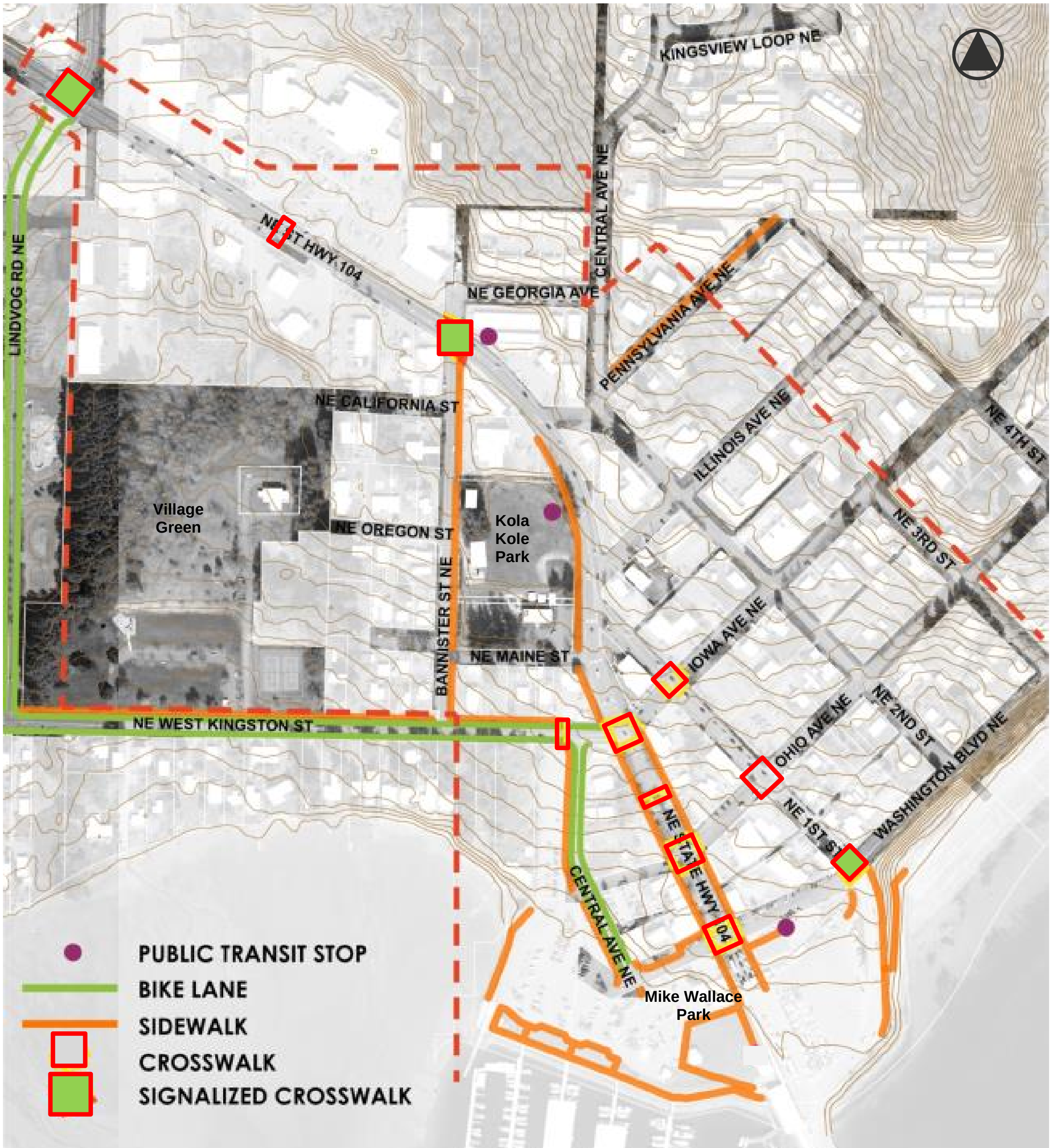
Figure 5 shows the existing pedestrian and bicycle facilities, in the project study area. Major non-motorized generators include the downtown core, the ferry/waterfront area, parks, the north commercial corridor, and surrounding residential. The Kingston area also includes a number of identified trails, as well as planned future trails, described in the *Kingston Complete Streets Report*.[7]

Most of the existing non-motorized infrastructure in the study area is located in the south and west areas. The downtown core has sidewalks on both sides of the street, and the sidewalk on the west side continues to the north end of Kola Kole Park. Sidewalks are also present on one side of Bannister Street NE and Central Avenue NE, and in the waterfront area. Bicycle facilities in the area consist of painted bicycle lanes on NE West Kingston Road and Central Avenue NE. Constraints of the existing non-motorized system in Kingston, described in detail in the *Kingston Complete Streets Report*, include the following.

- Although sidewalks are provided along Main Street in Downtown Kingston, they do not have sufficient width to accommodate high levels of activity.
- There is a lack of pedestrian and bicycle connection and presence of barriers between the Downtown Core and Waterfront Park areas.
- Local streets do not have sidewalks, and pedestrians share the lanes with vehicles. Some streets have narrow shoulders or planted strips where pedestrians may walk, but others have ditches along their lengths.
- Most crosswalks outside of Main Street in the Downtown Core do not connect to pedestrian facilities on either side.

[7] MacLeod Reckord, 2016.

Figure 5. Non-Motorized Existing Facilities

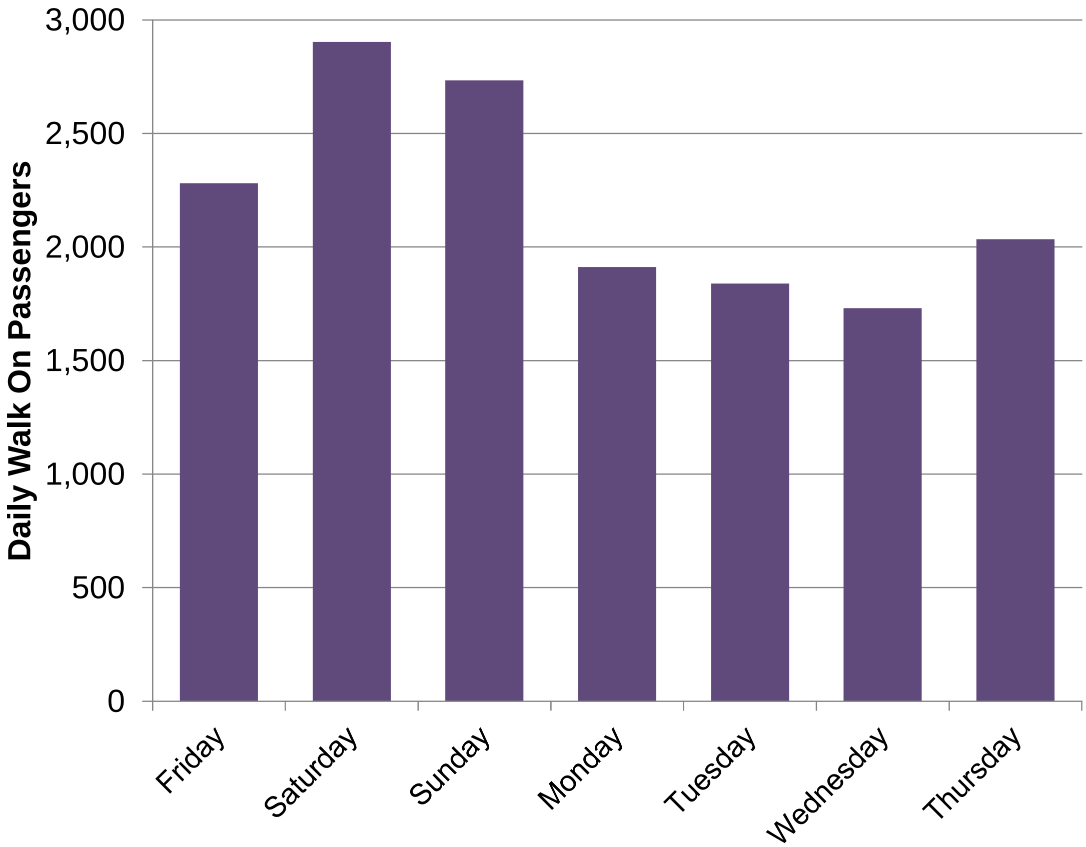


Source: MacLeod Reckord, Heffron Transportation, 2015.

Even with the large share of Kingston/Edmonds ferry passengers who access by vehicle, a considerable volume of pedestrian traffic is also generated by the ferry. Figure 6 summarizes the daily walk-on passengers counted by WSF during the week starting August 21, 2015, the same week in which the vehicle counts on SR 104 were conducted.[8] The weather was dry during the week of the counts, with temperature highs ranging from mid-70 to mid-80 degrees Fahrenheit. With these weather conditions occurring within the peak tourist and recreational activity season, the observed pedestrian and bicycle activity represent the higher end of the typical range over the year.

The figure shows walk-on passengers ranged from about 1,700 to 2,900 per day, with the highest numbers occurring on the weekend. The number of walk-on passengers per sailing ranged from about 40 to 150 during most daytime hours. These passengers include those who walk to and from the local neighborhoods, park-and-ride users who may park next to the ferry dock or elsewhere in downtown Kingston, and bus riders (on weekdays only).

Figure 6. Kingston/Edmonds Ferry Walk-On Passengers – Week Starting August 21, 2015



Source: Washington State Ferries, 2016. Walk-on passengers are counted only on westbound ferry; totals assume that each counted walk-on passenger generates two one-way trips, one westbound and one eastbound.

The WSF count data indicated a relatively low number of bicycle trips, with a total of 184 counted over the seven-day period. The majority of sailings did not include bicycle passengers; the counts indicated one to eight bicyclists on the sailings where they were present.

8 Washington State Ferries (WSF), 2016b. Ridership counts, Kingston-Edmonds route, August 21 through August 30, 2015.

2.6. Freight

WSDOT has established the Washington State *Freight and Goods Transportation System* (FGTS) to classify state highways, county roads, and city streets according to their annual freight tonnage.[9] There are five freight categories, ranging from T-1 to T-5, depending on the annual tonnage of freight that they carry, with T-1 carrying the highest amount (>10 million tons per year) and T-5 carrying the lowest amount (<100,000 tons per year). WSDOT identifies T-1 and T-2 facilities as statewide freight economic corridors.

In the project study area, SR 104 (mainline and couplet) and NE West Kingston Road are classified as T-3 roadways, carrying between 300 thousand and 4 million tons of freight per year. Although the Kingston streets carry less than a T-2 level of freight tonnage, they serve as a primary conduit for the delivery of freight and goods to north Kitsap County from the east Puget Sound area. The vehicle counts conducted on SR 104 indicated that heavy trucks make up about 6 to 8% of daily traffic through the study area.

2.7. Parking

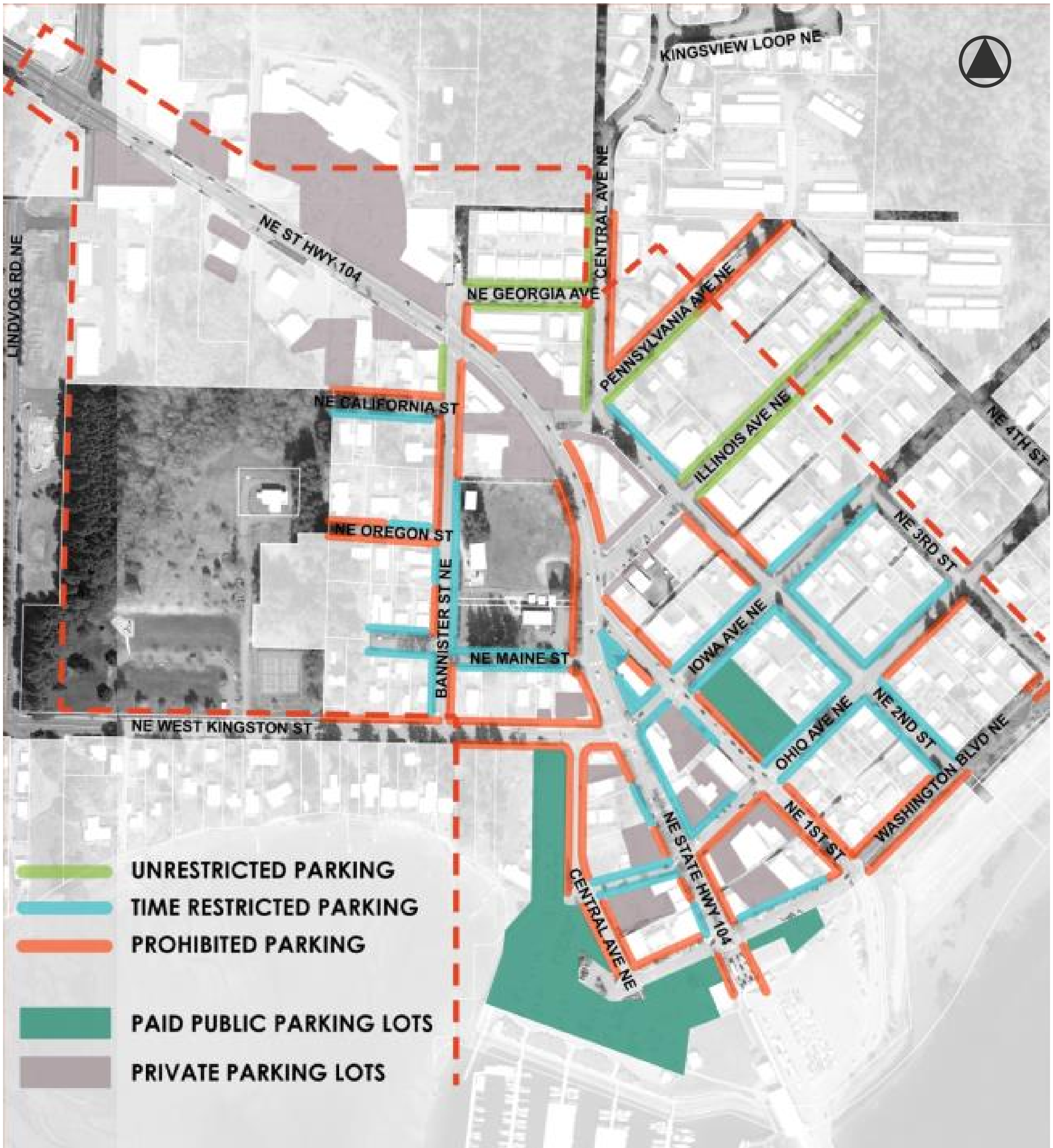
Parking in the project study area is accommodated by a combination of public on-street spaces, paid public lots, and privately-owned lots, shown on Figure 7. In the downtown area, on-street parking has a two-hour time limit to discourage long-term commuter parking and ensure that spaces are available for customers of downtown businesses. The majority of private lots provide free customer parking for adjacent businesses, although some are paid lots that appear to accommodate long-term commuter parking. Paid public lots in the study area accommodate both commuter and short-term parking. The largest public lot is located on the Port of Kingston property in the southwest corner of the study area. There is also a WSDOT-owned lot at 1st Avenue SE and Ohio Avenue NE. The smallest public lot is located along Washington Boulevard NE, between Main Street and 1st Avenue NE.

A detailed assessment of public parking utilization was conducted for conditions during peak and off-peak times of year. An inventory of public parking was completed, which included a count of on-street spaces as well as spaces in public lots. The parallel parking supply was estimated using guidelines provided in the City of Seattle's *TIP 117*,[10] which includes conversion rates for the unobstructed distance along which parking is available to an estimated number of parking spaces. This document was used because it is the best available resource for estimating parallel parking supply based on available curb length. It should be noted that these estimates are approximate and are intended only to provide an order-of-magnitude estimate; the actual number of cars that can park along a given length will depend on the size of the cars parked and the space between them.

The off-peak count was conducted on a typical weekday in February, reflecting conditions when tourist and recreational activity is low and the majority of parking demand is generated by regular ferry commuters, local residents, and employees and customers of local businesses. Peak season counts were conducted in July, and reflect conditions with high tourist and recreational activity. Peak season counts were conducted on a typical weekday, as well as during two regular summer Saturday events held in downtown Kingston—the Farmer's Market and evening concert. Table 2 summarizes the utilization of public parking in the study area during each of these periods.

9 Washington State Department of Transportation (WSDOT), 2014. Washington State Freight Mobility Plan, October.
10 City of Seattle, Department of Planning Development, May 12, 2011.

Figure 7. Existing Parking Characteristics



Source: MacLeod Reckord, Heffron Transportation, 2015.

Table 2. Existing Public Parking Supply and Utilization

Location	Capacity (spaces)	Off-peak Season Weekday Midday[1]		Peak Season Weekday Midday[2]		Saturday Farmer's Market[2]		Saturday Evening Concert[2]	
		Vehicles Parked	Utiliza-tion	Vehicles Parked	Utiliza-tion	Vehicles Parked	Utiliza-tion	Vehicles Parked	Utiliza-tion
Public Pay Lots									
WSDOT 1st Avenue Lot	72	25	35%	34	47%	45	63%	42	58%
Port of Kingston Lot	328	122	37%	166	51%	301	92%	275	84%
Washington Blvd Lot	32	19	59%	22	69%	20	63%	19	59%
On-Street Parking									
Time restricted	204	27	13%	20	10%	31	15%	36	18%
Unrestricted	90	27	30%	30	33%	27	30%	27	30%
Illegally parked	---	1	---	0	---	0	---	0	---
Total	726	221	30%	272	37%	424	58%	399	55%

Source: Heffron Transportation, 2015

1. *Off-peak season weekday count was conducted on Thursday, February 12, 2015.*
2. *Peak season Saturday counts were conducted on July 18, 2015, and the weekday count on Thursday, July 23, 2015*

The table shows that overall, utilization in the study area ranged from 30% during off-peak season midday to 58% during the Saturday Farmer's Market. Overall, increases in demand were reflected to the greatest degree in the Port of Kingston lot, which more than doubled during the Farmers' Market, when utilization at the Port's lot reached 92%. This is to be expected since this lot, which is the largest in the area, is also located near Mike Wallace Park where the events are held. However, the parking utilization results also are consistent with the observations of local business owners that higher levels of activity along the waterfront do not necessarily translate to higher levels of activity in the downtown area. The parking utilization results indicated that on-street parking was 43% utilized during both off-peak and peak season weekday conditions, increasing slightly to 48% during the Saturday events. However, it is also noted that utilization of the WSDOT lot, located across downtown from Mike Wallace Park, also showed increased use during the Saturday events. Utilization of the Washington Boulevard lot did not change significantly during the Saturday events.

The parking study results show that while demand does increase during events and periods of high activity, there is excess parking capacity that is not being used even during the high demand periods, particularly on-street. These results indicate that there is capacity available for potential complete streets improvements that would remove some on-street parking without significantly affecting overall parking conditions in the area. Additionally, improved pedestrian connections between the waterfront area and the downtown core could help make downtown parking feel more accessible for participants in waterfront events.

2.8. Collision History

Historical collision data for the study area were obtained from WSDOT for the five-year period from January 1, 2010 through December 31, 2014, summarized in Table 3. The collision type that occurred most frequently in the study area was rear-end collision, which most often results from driver inattention and is not unexpected in areas with frequent queues such as along SR 104 in Kingston. The location with the highest number of collisions was the vehicle holding area at the ferry dock, reflecting varying types. None of the collisions recorded in the study area over the five-year period resulted in a fatality. Overall, the data do not indicate any unusual conditions. However, any improvements that separate vehicular and non-motorized traffic, calm vehicular traffic, or help increase overall awareness of the mix of pedestrians, bicyclists, local vehicle traffic, and ferry vehicle traffic that navigate through Kingston, will improve safety conditions in the area.

Table 3. Historical Collision Summary

Intersection	Rear-End	Side-Swipe	Left Turn	Right Turn	Right Angle	Ped / Cycle	Other[1]	Total for 5 Years	Average/ Year
SR 104 / Lindvog Rd NE	5	2	1	0	1	0	0	9	1.8
SR 104 / Bannister St NE	2	0	1	0	0	0	1	4	0.8
SR 104 / Illinois Ave NE	0	0	0	0	0	0	2	2	0.4
SR 104 / NE West Kingston Rd	0	1	0	1	0	1	0	3	0.6
SR 104 / Ohio Ave NE	0	0	4	0	0	0	0	4	0.4
SR 104 / Washington Blvd NE	0	0	0	0	0	0	0	0	0.0
Central Ave NE / Ohio Ave NE	0	0	1	0	0	0	0	1	0.2
NE 2nd St / Ohio Ave NE	0	0	0	0	1	0	0	1	0.2
Roadway Segment	**Rear-End**	**Side-Swipe**	**Left Turn**	**Right Turn**	**Right Angle**	**Ped / Cycle**	**Other**	**Total for 5 Years**	**Average/ Year**
SR 104, Lindvog Rd NE – Bannister St NE	5	0	5	3	1	0	0	14	2.8
SR 104, Bannister St NE – Illinois Ave NE	2	0	0	0	0	0	1	3	0.6
SR 104, Illinois Ave NE – NE West Kingston Rd	0	0	0	0	0	0	0	0	0.0
SR 104, NE West Kingston Rd – Ohio Ave NE	1	0	0	0	0	0	0	1	0.2
SR 104, Ohio Ave NE – Washington Blvd NE	0	0	0	0	0	0	0	0	0.0
SR 104 couplet (NE 1st St), SR 104 – ferry dock	8	2	0	0	0	0	1	11	2.2
Bannister St NE, SR 104 – NE West Kingston Rd	0	0	0	0	0	0	2	2	0.4
West Kingston Rd NE, Lindvog Rd NE to SR 104	0	0	0	0	0	0	2	2	0.4
	Rear-End	**Side-Swipe**	**Left Turn**	**Right Turn**	**Right Angle**	**Ped / Cycle**	**Other**	**Total for 5 Years**	**Average/ Year**
Ferry Toll Booth/Holding Area	3	2	0	4	1	2	4	16	3.2

Source: City of Seattle Department of Transportation, Collision data for the period 01/01/2010 through 12/31/2014.

1. *The majority of "Other" type collisions recorded in the area involved single vehicle collisions with parked cars or fixed objects.*

3. OVERVIEW OF COMPLETE STREETS PLAN

The Complete Street Plan consists of a series of projects numbered 1 through 20, described in detail in the *Kingston Complete Streets Report*.[11] The proposed projects would provide a complete pedestrian and bicycle network within the study area, as well as green stormwater facilities on some streets, while also providing the facilities and capacity needed to accommodate ferry-generated automobile and truck traffic. The *Kingston Complete Streets Report* presents the following two alternatives:

Alternative A: Existing SR 104 Configuration – With this alternative, the configuration of SR 104 would remain unchanged, with ferry access occurring via Main Street, and ferry egress occurring via NE 1st Street. Pedestrian and bicycle improvements would be made along the study area streets, but ferry-bound vehicle traffic would continue to mix with local vehicle, pedestrian, and bicycle traffic on Main Street. This alternative may serve as an interim solution while funding is being pursued for the Alternative B reconfiguration.

Alternative B: Reconfigured SR 104 – This alternative would reconfigure SR 104, widening NE 1st Street to four lanes, converting it from one-way to two-way operation, and reconfiguring the roadway and ferry dock so that all vehicles accessing and exiting the ferry would use this street. The ferry toll booths would be moved to NE 1st Street. With inbound ferry traffic moved to NE 1st Street, Main Street would be converted to local use. Main Street south of NE West Kingston Road, and Washington Boulevard NE between Main Street and NE 1st Street, would be converted from one-way to two-way operation.

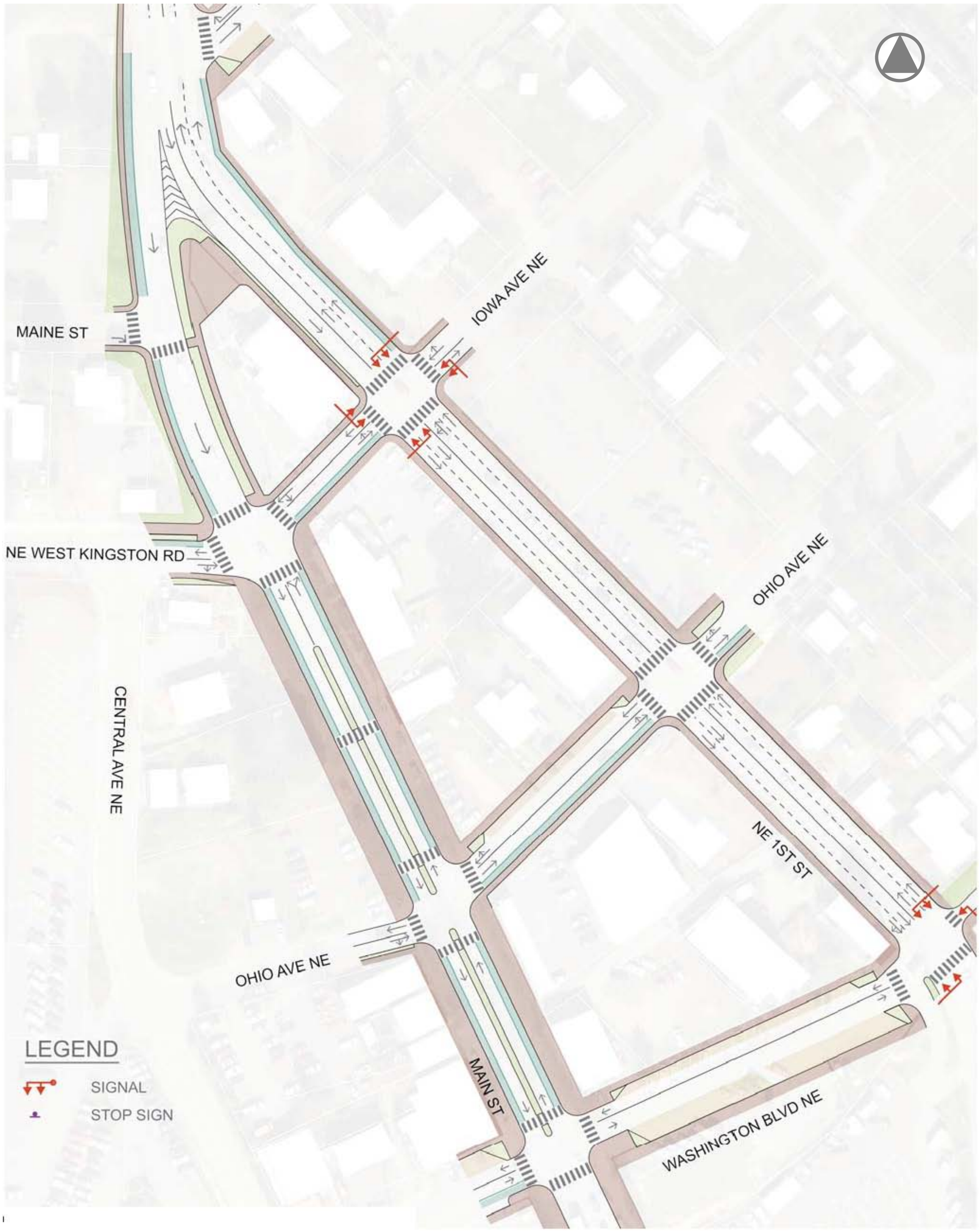
With this alternative, the County would apply for NE 1st Street to be re-designated as the SR104 mainline, and Main Street to be removed from the state highway system and re-designated as a local street. The pedestrian and bicycle improvements identified for study area streets outside of SR 104 would be the same as Alternative A. With this alternative, NE 1st Street/SR 104 would be widened to have two westbound lanes between the ferry dock and Bannister Street NE, where the left lane would then drop to a left-turn lane. In the eastbound direction, there would be one general purpose lane to the east of Illinois Avenue NE that would then split into the inbound ferry lanes on NE 1st Street/SR 104 and local lane on Main Street. West of Bannister Street NE, SR 104 would continue to have the same three lane section that currently exists (one lane in each direction plus a center two-way left turn lane). Decoupling these one-way streets and making them both two-way streets would require traffic control where they intersect. The following two traffic control options were evaluated:

> **Option 1: Traffic Signal Control** – Shown on Figure 8, a traffic signal would be installed at the NE 1st Street/Iowa Avenue NE intersection.
>
> **Option 2: Roundabout Control** – Shown on Figure 9, a roundabout would be installed just north of NE West Kingston Road. To provide sufficient right-of-way to accommodate the roundabout, Iowa Avenue NE would need to be closed where it currently intersects with NE 1st Street; this would prohibit direct vehicle access at this location, but a non-motorized connection would still be maintained.

The operating and safety characteristics of each of these alternatives and options are described and evaluated in detail in the following section.

[11] MacLeod Reckord, 2016.

Figure 8. Traffic Signal Option for Reconfigured SR 104 (Alternative B, Option 1)



Source: MacLeod Reckord, 2016.

Figure 9. Roundabout Option for Reconfigured SR 104 (Alternative B, Option 2)

Source: MacLeod Reckord, 2016.

4. CONDITIONS WITH PROJECT ELEMENTS

4.1. Ferry Access and Egress

With Alternative A, ferry access and egress would be the same as existing. Vehicles would enter the ferry dock via Main Street, and exit via NE 1st Street. Pedestrians would enter and exit the terminal via the pedestrian bridge that leads to and from Main Street. Bicyclists would continue to mix with vehicle traffic in both directions.

With Alternative B, the ferry toll booths would be moved to the east end of NE 1st Street, and vehicle traffic would access and egress the ferry dock via NE 1st Street. Pedestrians would enter and exit the terminal via the pedestrian bridge that leads to and from Main Street, similar to existing conditions and Alternative A. Bicyclists would have a separate path between the ferry dock and Main Street, so would enter and exit the ferry dock separately from vehicle traffic.

4.2. Vehicle Operations

The biggest difference between Alternatives A and B would be the relative vehicle traffic flows on Main Street and NE 1st Street, discussed in detail in the following sections.

4.2.1. Alternative A – Existing SR 104 Configuration

With Alternative A, vehicle operations through downtown Kingston would remain generally the same as existing with continued operation of the couplet. The couplet's design favors the major vehicle flow on SR 104, and vehicles traveling through Kingston to and from the ferry would be relatively unimpeded.

Issues identified with the existing configuration would also continue. Namely, since ferry-generated traffic flow would continue to dominate traffic flow on both Main Street and NE 1st Street, local vehicular traffic crossing SR 104 (mainline or couplet) or traveling to and from Kingston homes, businesses and activities would need to continue adjusting their travel times and routes to circumvent the ferry traffic to the greatest extent possible. The shortened section of weaving action for exiting ferry traffic on NE 1st Street (described previously in *Vehicle Volumes and Operations*) would also continue with this alternative.

4.2.2. Alternative B – Reconfigured SR 104

With Alternative B, traffic flow would be similar for both the signal and roundabout control options to the west of Illinois Avenue NE, and east of Ohio Avenue NE. West of Illinois Avenue NE, eastbound vehicles on SR 104 would be channelized using pavement marking and signage, with ferry-bound traffic approaching the downtown core in the left lane and local traffic approaching in the right lane. The left lane would curve eastward and transition into NE 1st Street, widening to two lanes as it approaches the ferry toll booths. The right lane carrying eastbound local vehicles would transition into Main Street.

Westbound (exiting) ferry traffic would travel in two lanes on NE 1st Street as it exits the ferry dock. Local westbound traffic exiting Main Street could access SR 104 via the local streets that connect Main Street and NE 1st Street, or via the signal or roundabout-controlled intersection of the two streets. The two westbound SR 104 lanes would continue to NE Bannister Street, where the left lane would drop to left-turn pocket. West of NE Bannister Street, the three-lane section of SR 104 (one general purpose lane in each direction and a two-way left-turn lane) would continue, same as existing. Extension of the two-lane section of westbound SR 104 from Iowa Avenue NE to NE Bannister Street, would add about 1,000 feet to the weaving area for outbound ferry traffic, lengthening it from about 600 feet to 1,600 feet. This should alleviate exiting drivers' impulses to immediately merge right as they exit the ferry dock, which is observed under existing conditions and would be expected to continue with Alternative A.

Both traffic control options would remove the existing left-turn pocket from eastbound SR 104 to Illinois Avenue NE. In order to have sufficient width to accommodate three vehicle lanes (two westbound, one eastbound) as well as the desired width of non-motorized facilities, it may be necessary to also eliminate the left-turn pocket from eastbound SR 104 to NE 2nd Street. The left-turn volumes may be low enough that turns could still be accommodated from the one general purpose lane with minimal degradation of operations on SR 104. Alternatively, local traffic could be channeled from eastbound SR 104 into the residential neighborhoods via NE Bannister Street and Georgia Avenue NE. Otherwise, the width of non-motorized facilities may need to be narrowed to accommodate the additional vehicle lane. The optimal configuration would be determined at the project-design level.

Both traffic control options include turning restrictions at several intersections of side streets with SR 104. Restrictions recommended to the north of the downtown core would reduce left-turn conflicts for vehicles entering SR 104; these locations have viable alternative routes to access SR 104 using the local street grid. The restrictions along NE 1st Street would reduce potential conflicts and delay resulting from mixing of local and ferry traffic, and also help discourage queue cutting during peak ferry conditions. It would be possible to implement the NE 1st Street restrictions only during peak conditions when the ferry queue extends beyond the holding area through signage (potentially including variable message signs).

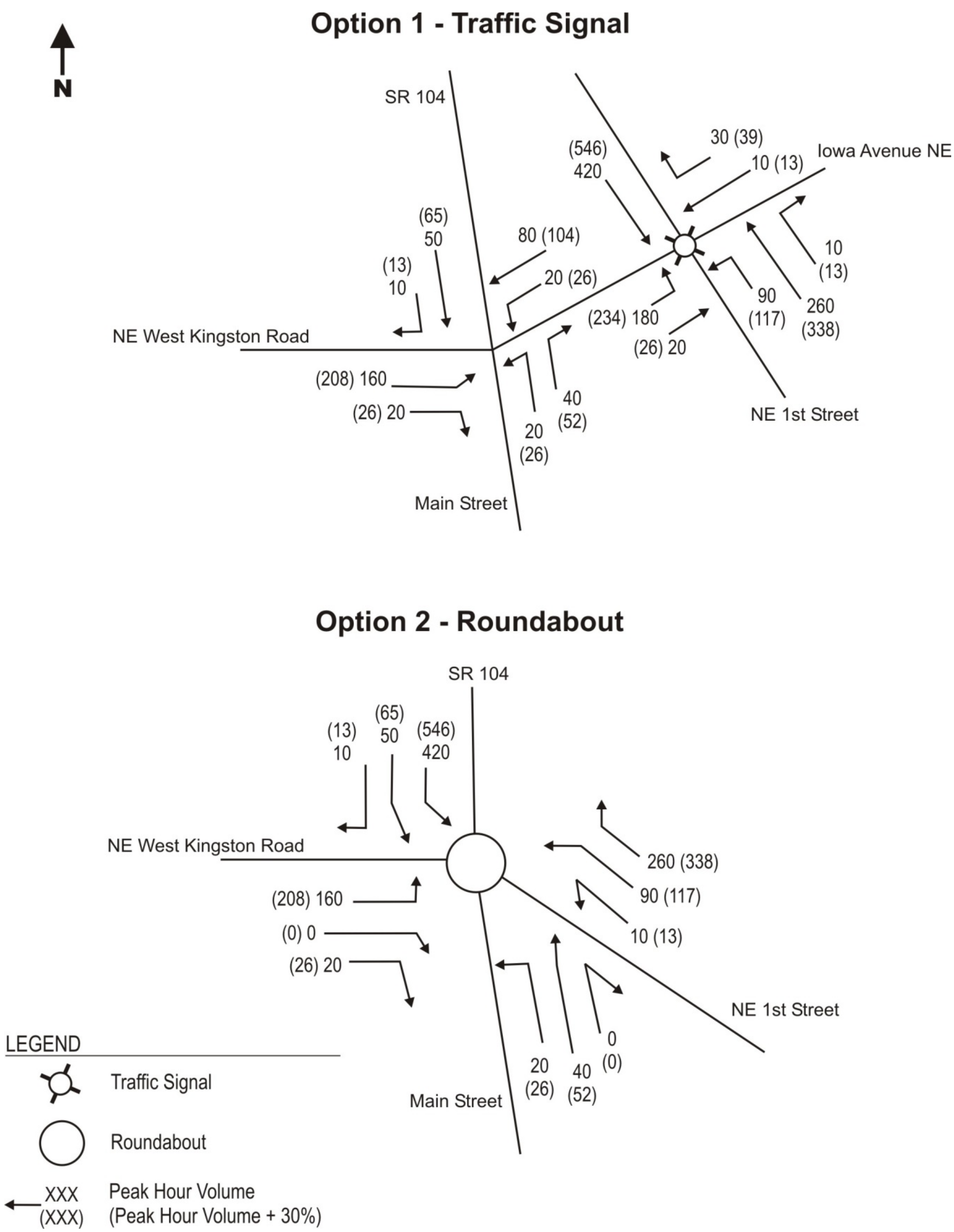
The Alternative B reconfiguration would need to be designed according to WSDOT design standards to ensure that SR 104 and NE West Kingston Road could continue to accommodate freight and goods carried by large trucks.

Analysis Volumes

Analysis volumes for the traffic control options were projected based upon the peak season, peak hour traffic counts conducted on SR 104 in August 2015, ferry vehicle counts conducted during the same period as the SR 104 counts, and recorded notes provided by the County regarding the portion of ferry traffic (about 25%) that travels to and from the west via NE West Kingston Road. Since the baseline data reflect conditions with the Saturday Farmers' Market, the volumes represent a cumulative condition with peak demand ferry traffic combined with higher local traffic generated by an event in downtown Kingston. It should be noted that with peak demand conditions, ferry-bound traffic from West Kingston Road would need to join the queue at the appropriate location upstream, and would not be able to turn directly on to NE 1st Street. The analysis volumes assume that vehicles arriving from NE West Kingston Road would travel to SR 104 via Barber Cutoff Road, approaching the Iowa Avenue NE intersection from eastbound SR 104.

Figure 10 shows the existing analysis volumes for both the signal and roundabout traffic control options. With the Kingston/Edmonds ferry route serving as the primary generator of vehicle traffic, volumes in Kingston are constrained by the vehicle capacities of the ferry vessels. As discussed previously, the route is served by the larger capacity vessels in the WSF fleet, and these capacities are reflected in the SR 104 counts that provide the baseline for analysis. Peak conditions are characterized by longer ferry queues, which translate to more hours of the day with high volumes, rather than significant volume increases in any one hour. Currently, there are no plans to increase ferry frequencies to more than the existing 1 to 2 sailings per direction per hour. For these reasons, it is not expected that the design peak hourly volume would increase significantly in the future. However, to test the resiliency of the potential traffic control options, they were also evaluated for conditions with a 30% increase over existing volumes. Also shown on Figure 10, these volumes reflect a conservatively high future scenario.

Figure 10. Peak Condition Analysis Volumes for Reconfigured SR 104 (Alternative B)



Source: Heffron Transportation, 2016.

Level of Service

Level of service (LOS) analysis was performed for the peak condition volumes described in the previous section. Level of service is a qualitative measure used to characterize traffic operating conditions. Six letter designations, “A” through “F,” are used to define level of service. LOS A and B represent conditions with the lowest amounts of delay, and LOS C and D represent intermediate traffic flow with some delay. LOS E indicates that traffic conditions are at or approaching congested conditions and LOS F indicates that traffic volumes are at a high level of congestion with unstable traffic flow. Level-of-service criteria for signalized and unsignalized intersections are provided in Appendix A. The County has adopted a standard of LOS D for urban collector and arterial streets, though they are applied to roadway segments, not intersections.[12] WSDOT has adopted a standard of LOS D for urban Highways of Statewide Significance, also with a segment-based approach.[13] Although neither of these directly apply to intersections, for purposes of this report acceptable operation is considered to be LOS D or better, consistent with these standards.

Levels of service for the reconfigured intersections were analyzed using methodologies presented in the Highway Capacity Manual (HCM).[14] Levels of service for intersections were calculated using Trafficware’s *Synchro 8.0* analysis software using the *HCM 2010 Signalized* and *Unsignalized* modules. Operations at roundabouts were evaluated using SIDRA analysis software. Analysis takes into account the fluctuations in traffic that result from the ferry surges through use of a Peak Hour Factor (PHF), which assumes that the highest 15-minutes of traffic flow occurs for the entire hour.

Level of service for intersections is defined in terms of average delay per vehicle in seconds. For a signalized intersection, level of service is based upon average delay for all vehicles traveling through the intersection. The level of service for a one- or two-way stop-controlled intersection is determined by the average delay for the most congested movement through the intersection, typically the stop-controlled directions. Delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. Unsignalized intersections have different level of service threshold values than signalized intersections, primarily because drivers expect different levels of performance from different types of transportation facilities. In general, unsignalized intersections are expected to carry lower volumes of traffic than signalized intersections. Therefore, for the same level of service, a smaller amount of delay is acceptable at unsignalized intersections than for signalized intersections. The level of service at a roundabout is based on the volume of traffic that must merge within the roundabout, and the features provided such as number of lanes, radius, entrance angle, and other features.

Option 1 – Traffic Signal

The analysis completed for the traffic signal option considered different phasing options for the signal at NE 1st Street/Iowa Avenue NE, and different stop control options for Main Street/NE West Kingston Road/Iowa Avenue NE, described as follows.

At NE 1st Street/Iowa Avenue NE, the effect of different phasing options to accommodate the westbound left turn from NE 1st Street to Iowa Avenue NE was evaluated, including a permitted left turn phase and a permitted-protected left turn phase. All scenarios assumed permitted left-turn phasing for the movement from Iowa Avenue NE to NE 1st Street. Table 4 summarizes the analysis results for this intersection, and shows that either phasing option is expected to result in operation of LOS C or better for both existing conditions and the future growth scenario. However, average delay would be lower with protected-permitted left-turn phasing.

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12 Kitsap County, 2012. Comprehensive Plan Environmental Impact Statement (EIS), Transportation Element.
13 Washington State Department of Transportation (WSDOT), 2010. Level of Service Standards for Washington State Highways. January 1.
14 Transportation Research Board, 2010. Highway Capacity Manual, Special Report 209.

Table 4. Level of Service at NE 1st Street/Iowa Avenue NE with Signal Option

Location	Existing Peak Condition				Existing Peak + 30%			
	Permitted		Permitted-Protected		Permitted		Permitted-Protected	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
NE 1st Street / Iowa Avenue NE	B	10.3	A	8.2	C	24.9	B	15.1

LOS = level of service; Delay = average seconds per vehicle.
Source: Heffron Transportation, 2016.

The direction of stop-control at Main Street/NE West Kingston Road/Iowa Avenue NE that would result in most efficient operation was also evaluated. The existing intersection has eastbound-westbound stop control; analysis also considered changing the stop control to northbound-southbound and allowing free flow in the east-west directions. Table 5 summarizes the results, and shows that with either scenario, the stop-controlled movements would be LOS C or better for both existing conditions and the future growth scenario. However, as shown on Figure 10, the heavier vehicle flow is expected in the east-west directions, so east-west free flow would benefit more vehicles.

Table 5. Level of Service at Main Street/NE West Kingston Road/Iowa Avenue NE

	Existing Peak Condition		Existing Peak + 30%	
	LOS[1]	Delay[2]	LOS	Delay
With East-West Stop-Control				
Eastbound movements	B	14.2	C	17.3
Westbound movements	B	14.7	C	18.7
With North-South Stop-Control				
Northbound movements	B	13.0	C	15.5
Southbound movements	B	14.6	C	17.6

LOS = level of service; Delay = average seconds per vehicle.
Source: Heffron Transportation, 2016.

Queuing analysis was completed for Iowa Avenue NE, between Main Street and NE 1st Street. With a heavy turning movement from NE 1st Street to Iowa Avenue NE, there is a concern that westbound queued vehicles at Main Street would exceed the available storage length of about 110 feet (which would typically accommodate 4 to 5 automobiles) and spill onto SR 104.

Queuing analysis for Iowa Avenue NE was completed using *SimTraffic* software. Results reflect the average of 10 simulations per scenario, which evaluated the combined effect of the signal at NE 1st Street with the stop-control characteristics at Main Street. Simulations were run for conditions with permitted and permitted-protected left-turn phasing of the signal, but the results were not substantially different between them. The analysis results, summarized in Table 6, reflect the permitted-protected phasing since the estimated queues were slightly higher. The table presents the average vehicle queue length that was calculated, as well as the 95th percentile queue (indicating that the queue is expected to be at that length or shorter 95% of the time). As shown, westbound queues are generally expected to fit within the available space with both stop-control scenarios, but would be shorter with northbound-southbound stop-control. The future growth scenario shows the 95th-percentile queue approaching the maximum available space with east-west stop control. These results, consistent with the level of service results, indicate that while conditions should be acceptable with either scenario, northbound-southbound stop control results in a more favorable condition.

The table also shows that eastbound queues at NE 1st Street—stopped at the signal and waiting to enter or cross the street—may exceed the available storage space on Iowa Avenue NE with peak conditions. However, overspill would primarily affect operation on Main Street, a local access street with this scenario. Additionally, the high eastbound traffic movement that was evaluated reflects a cumulative worst-case scenario with peak ferry demand combined with a local traffic-generating event (e.g. the Farmers' Market). Most hours of the day and days of the year do not reflect these cumulative conditions, and it expected that most of the time, the eastbound queues generated by local traffic could be accommodated within the existing space.

Table 6. Queueing on Iowa Avenue NE with Signal Option

	Existing Peak Condition				Existing Peak + 30%			
	E-W Stop Control		N-S Stop Control		E-W Stop Control		N-S Stop Control	
Direction	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile	Average	95th Percentile
Westbound at Main St	52 feet	85 feet	16 feet	51 feet	67 feet	106 feet	32 feet	90 feet
Eastbound at NE 1st St	105 feet	**134 feet**	99 feet	**138 feet**	**117 feet**	**124 feet**	**119 feet**	**129 feet**

Source: Heffron Transportation, 2016. Values in ***bold*** *would exceed the available storage space of ~110 feet.*

The results presented above indicate that with Option 1 – Traffic Signal, a permitted-protected left-turn phase from westbound NE 1st Street to Iowa Avenue NE, and north-south stop-control at Main Street/ NE West Kingston Road/Iowa Avenue NE, is expected to provide the most efficient overall operation, and also the most flexibility to accommodate queues. However, much more detailed project-level analysis would be completed to determine the actual design, prior to implementation of the project.

It would be possible to additionally implement a traffic signal solution that provides a similar traffic control function to that of the WSP officers during peak ferry demand conditions when queues extend beyond the ferry holding area. The ferry queue lane at Lindvog Road NE could have its own signal that communicates with vehicle detectors installed downstream, south of NE West Kingston Road/Iowa Avenue NE. The traffic signal would turn green, allowing vehicles to proceed to the ferry toll booths, only when the downstream detectors indicate that queues do not extend past them. At the very least this would provide support to the WSP officers managing peak condition traffic in Kingston, but it would also support queue management during periods when peak surges are unanticipated or officers unavailable. Distribution of reservation cards to upstream queued vehicles would still be needed to prevent ferry queue cutting.

Option 2 – Roundabout
Level of service was evaluated for the projected volumes shown on Figure 10 using SIDRA software. Similar to a signalized intersection, level of service is based upon the average delay for all vehicles traveling through the roundabout. The analysis indicated operation of LOS B or better for the existing peak volumes and the future growth scenario.

The calculated level of service indicates that the roundabout would have sufficient capacity to accommodate the projected vehicle volumes. However, there would be challenges with accommodating ferry vehicle queues through the roundabout that cannot be captured in a standard level of service calculation. The advantage of a roundabout is that it allows vehicles to continuously circulate through the intersection, yielding to other vehicles as needed, but with minimal need to stop. However, a ferry queue extending through the roundabout could impede much of this advantage. Local traffic traveling through the roundabout would need to weave with ferry traffic, which could potentially move very slowly or be completely stopped. As shown on Figure 9, the critical weaving area between the local and ferry traffic would be marked with "do not block" signage and pavement striping, but would still be dependent upon drivers following these directions. One errant ferry-bound vehicle stopped in the "do not block" area could significantly impact local traffic flow through the roundabout. Traffic flow through the roundabout during peak ferry conditions could be managed with traffic direction by the WSP; however, this would move Kingston toward a higher level of dependency on manual traffic control. It would also be possible to manage some potential issues with supplemental traffic signal control, but this redundancy would be more costly and less efficient than a straight signal option. For these reasons, a roundabout is not recommended.

4.3. Transit

With Alternative A, access to transit would be the same as existing, with the Kitsap Transit bus stop located on Washington Boulevard NE between Main Street and 1st Avenue NE, about 550 feet walking distance from the end of the ferry pedestrian bridge.

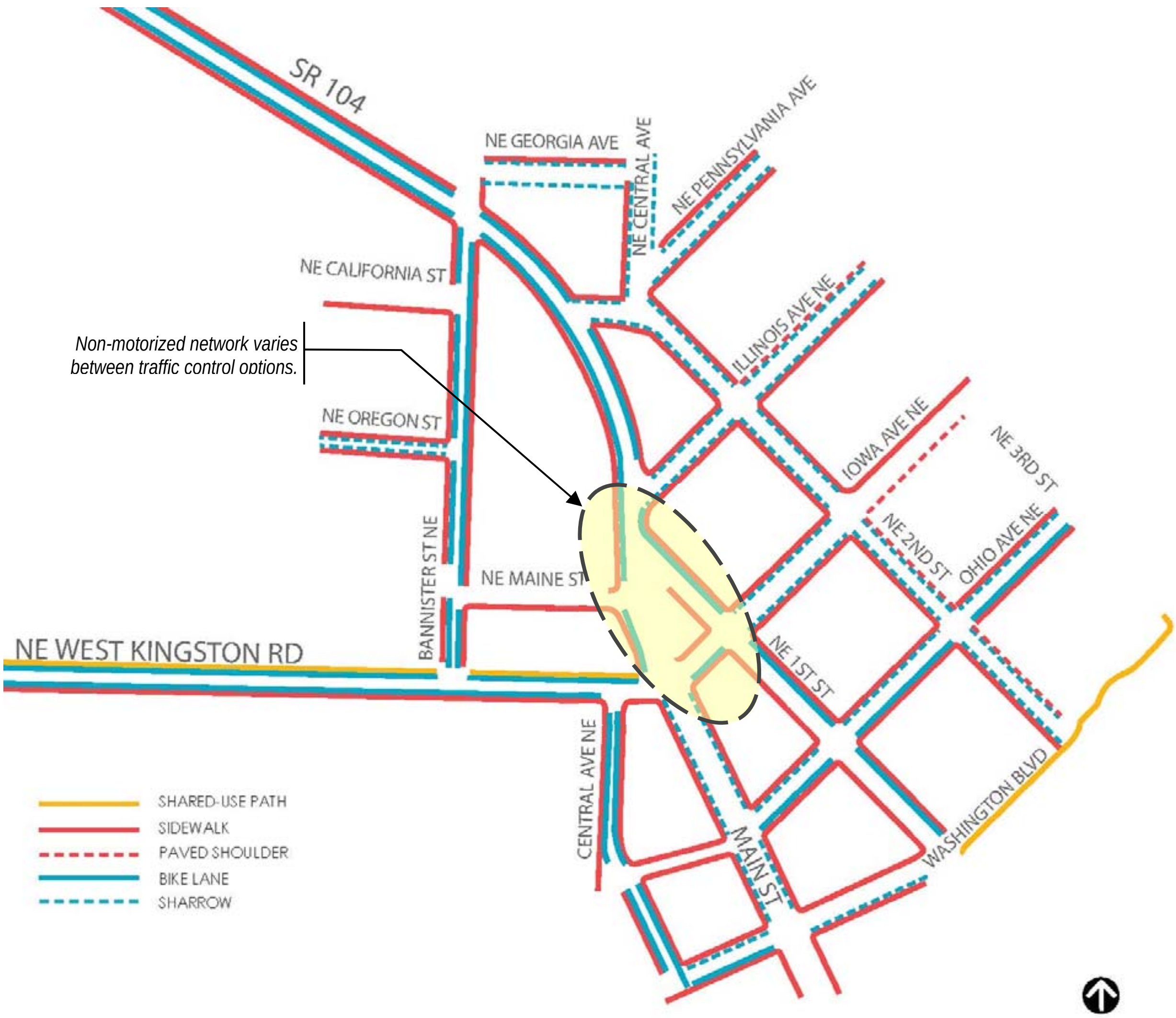
Alternative B is more favorable for transit because it could allow the bus stop to be moved closer to the ferry terminal without causing buses to be impeded by vehicle traffic exiting the ferry dock , improving transit accessibility. With the Alternative B reconfiguration, buses could access and egress the ferry dock via Main Street, separate from the vehicle traffic accessing and egressing via 1st Avenue NE. The potential effect on transit of the Alternative B traffic control options would be the same as described in the previous section for overall vehicle operations.

With both alternatives, completion of the pedestrian and bicycle network in the downtown core and the north commercial area would improve accessibility to transit. Increased separation from vehicular traffic would also improve safety conditions for people waiting at the transit stops.

4.4. Non-Motorized

Figure 11 shows the pedestrian and bicycle network that would be in place with implementation of the Complete Street projects. Both alternatives would complete the non-motorized grid, providing distinct space for pedestrians and bicyclists to travel throughout the study area. A sidewalk or pathway would be provided on at least one side of all streets within the study area, and on both sides of most. Separate bicycle lanes would be provided along Main Street and most of SR 104 north of the downtown core (potentially with sharrows provided along one eastbound section where physical constraints may preclude a bike lane). Sharrows would be provided along most of the low-volume local access streets, reminding drivers and bicyclists to share the road. The presence of pedestrian facilities, bicycle facilities, and landscaping would also serve a traffic calming function for vehicles traveling through the area.

Figure 11. Non-Motorized Network with Implementation of Complete Streets Projects



Source: MacLeod Reckord, 2016.

Overall, Alternative B is more favorable for non-motorized travel because it would further separate non-motorized and ferry-generated vehicle traffic, with the majority of vehicle traffic occurring on NE 1st Street, and enhanced pedestrian and bicycle facilities a major focus of Main Street. Moving the highway vehicle operation would allow Main Street to be narrowed from four to two vehicle lanes, with the additional width providing opportunity to widen the sidewalks and provide separate bicycle facilities.

Within Alternative B, the traffic signal option is more favorable to non-motorized traffic than the roundabout option, because signalized crosswalks provide greater protection from vehicular conflicts. The roundabout would have longer pedestrian crossings of streets, and bicycles would potentially need to weave with vehicle traffic when navigating through it.

4.5. Parking

Buildout of all project elements is expected to remove parking spaces, and/or require parking reconfiguration, at the following locations:

- Up to 5 spaces would be affected at the north end of Bannister Street NE, on the west side.
- Up to 15 spaces would be affected at the south side of SR 104, between Bannister Street NE and NE 2nd Street.
- Up to 21 spaces would be affected along Iowa Avenue NE.

This totals up to 41 parking spaces potentially removed from the study area as a result of buildout of the Complete Streets Project, reducing the total capacity in the study area. It is expected that drivers who would park in these spaces would instead park in other available spaces nearby. Table 7 shows the effect that this would have on parking utilization during the highest demand period observed in the parking study. The table shows that with removal of these parking spaces, peak parking utilization would increase from 58% to 62%, but the area would still have an excess capacity of more than 250 spaces. Parking efficiency could potentially be improved through provision of signage that clearly identifies long-term and short-term parking options in the area. There may also be opportunity to lower the total number of parking spaces removed through reconfiguration of other parking near the affected areas.

Table 7. Public Parking Supply and Peak Utilization – With and Without Project

	Without Project (Existing)			With Project Buildout		
Location	Capacity (spaces)	Peak Demand[1]	Utilization	Capacity (spaces)	Peak Demand	Utilization
Public Pay Lots						
WSDOT 1st Avenue Lot	72	45	63%	72	45	63%
Port of Kingston Lot	328	301	92%	328	301	92%
Washington Blvd Lot	32	20	63%	32 [1]	20	63%
On-Street Parking						
Time restricted	204	31	15%	183	31	17%
Unrestricted	90	27	30%	70	27	39%
Total	726	424	58%	685	424	62%

Source: Heffron Transportation, MacLeod Reckord, 2016.

1. *Capacity at Washington Boulevard could slightly increase or decrease with the proposed reconfiguration, but is not expected to substantially change public parking capacity.*

5. TRANSPORTATION POLICY REVIEW

The Kingston Complete Streets project is supported by plans and policies at the state, regional and county levels. The greatest opportunities related to state and regional policy are measures that encourage and increase walk-on ferry ridership, including improving transit service and intermodal connections at ferry terminals. Policies also support development and improvement of the multimodal transportation network, including improvements to integrate SR 104 more holistically with the "main street" character of downtown Kingston. Relevant state and regional policies are discussed in the following sections.

5.1. Washington State

Policies at the state level put great focus on measures to encourage and expand ferry service for walk-on passengers. This focus is not only consistent with goals to encourage transportation mode alternatives to the SOV, but also reflects a practical strategy that recognizes the limits to increasing the peak-period vehicle capacity of ferries, and therefore seeks to accommodate future growth in demand through increasing off-peak and walk-on ridership.

The WSF *Long-Range Plan*[15] identifies vehicle capacity during peak periods as WSF's greatest constraint, and as the main source of pressure for additional services and larger facilities. It indicates limited capacity to support vehicle growth in peak periods, especially in the summer. No terminal improvements are identified in the Long-Range Plan for Kitsap terminals, though it does identify planned upsizes for vessels on the Bremerton/Seattle and Southworth/Vashon/Fauntleroy routes. Given the limits of expanding peak-hour vehicle capacity, the plan is built on key strategies designed to either spread vehicle demand to non-peak periods or increase walk-on use. These include expansion of the vehicle reservation system, transit enhancements (including improved access through non-motorized improvements) and pricing strategies. WSF is currently updating its long-range transportation plan, but it is expected that updated policies will continue to encourage improvements to increase walk-on passengers and shifts in vehicle demand to off-peak periods.

The *Washington Transportation Plan*[16] is based upon the following six transportation policy goals established by the Legislature.

- **Economic Vitality**: To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a prosperous economy.
- **Preservation**: To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services;
- **Safety**: To provide for and improve the safety and security of transportation customers and the transportation system;
- **Mobility**: To improve the predictable movement of goods and people throughout Washington state;
- **Environment**: To enhance Washington's quality of life through transportation investments that promote energy conservation, enhance healthy communities, and protect the environment; and

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15 Washington State Ferries (WSF), 2009. Final Long-Range Plan, June 30.
16 Washington State Transportation Commission (WSTC), 2010. Washington Transportation Plan 2030: Connecting Washington Communities for a Prosperous Future, December.

- **Stewardship**: To continuously improve the quality, effectiveness, and efficiency of the transportation system.

The Plan identifies maintaining and improving connectivity of island and peninsular regions to WSF as a recommended action to strengthen the connectivity of people and communities. The Kingston Complete Streets project strongly supports these goals with proposed projects that would improve safety and predictability for all travel modes, encourage active transportation and a healthy community, while also improving mobility on SR 104, designated as a significant highway needed to promote and maintain statewide travel and economic linkages in Washington State

WSDOT policies regarding state highways in urban settings have evolved significantly over the past several years, and are supportive of improvements such as those identified for the Kingston Complete Streets project. In 2006, WSDOT published *Understanding Flexibility in Transportation Design*[17], which is intended as a companion guide to the *WSDOT Design Manual*. Recognizing that the *Design Manual* has traditionally focused on freeway and rural highway-type designs, this report provides conceptual guidance for designing a project based not only on specific transportation objectives, but also on its effect on the aesthetic, social, economic, and environmental values of the larger community setting. Guidance is based on the concept of Context Sensitive Design,[18] which recognizes that projects should:

- Optimize safety of the facility for both the user and the community;
- Be in harmony with the community, and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area;
- Be designed and built with minimal disruption to the community; and
- Involve efficient and effective use of the resources (time, budget, community) of all involved parties.

WSDOT completed the *Complete Streets and Main Street Highways Program* Report[19] which expands upon these principles. This report recognizes that state highways function as main streets for many towns and cities through Washington, and that highway treatments must be context-specific based on size, location, and community needs.

Legislation passed in 2011 (HB 1071) directed WSDOT to develop a funding program for Main Street Highways projects, which would support local agencies in funding non-motorized and other Complete Streets improvements on state routes that also serve as a main street for Washington towns and cities. This legislation reflected a state-level commitment to implementing non-motorized improvements on state facilities that serve as main thoroughfares in urban areas, and may provide future opportunities for funding of this type of project. Although this is currently an unfunded program, it is important to recognize that the improvements proposed for the Kingston Complete Streets Project strongly support the goals of this legislation.

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17 Washington State Department of Transportation (WSDOT), 2006. Understanding Flexibility in Transportation Design – Washington, April.

18 Washington State Department of Transportation (WSDOT), 2011a. Context Sensitive Design, Accessed at www.wsdot.wa.gov/design/policy/csdesign, January 2016.

19 Washington State Department of Transportation (WSDOT), 2011b. Washington's Complete Streets & Main Streets Program, Case Studies and Practical Resource Guide, Publication No. WA-RD 780.1, November.

5.2. Puget Sound Regional Council

Non-motorized transportation is a key element in the Puget Sound Regional Council's (PSRC's) *VISION 2040*[20] and *Transportation 2040*,[21] which call for the development of a transportation system that creates more travel choices while preserving environmental quality and open space. The plans acknowledge that bicycle and pedestrian transportation play a key role in achieving these goals, and that the region's sidewalks, bike lanes, bikeways and trails support a significant and growing amount of regional transportation. Regional policies that support non-motorized travel include those that encourage compact urban design to better accommodate walking and bicycling, encourage incorporation of "healthy community" policies into urban design and decision-making, provide direction for local agencies to include non-motorized modes in concurrency programs and to focus level of service standards on the movement of people and goods, rather than movement of vehicles, support design, construction and operation of transportation systems to accommodate all users, including pedestrians and bicyclists, and emphasize transportation investments that provide and encourage alternatives to SOV travel.

VISION 2040 identifies ferry terminals as key facilities that support regional centers and intermodal hubs, and has indicated in its action strategies that the PSRC should take a leadership role in coordinating development and implementation of a long-range regional ferry service plan and ensuring that vehicle and passenger-only ferry service is integrated with transit and roadway investments. *Transportation 2040* supports study of passenger-only ferry service between Bremerton, Kingston and Southworth and downtown Seattle as an area for strategic capacity investments. It encourages higher density mixed-use development in the vicinity of ferry terminals and multimodal transportation improvements to further support this objective.

The PSRC has also developed the *Active Transportation Plan*,[22] which highlights the need for safe environments for walking and bicycling for people of all ages and abilities, and was adopted as an appendix to *Transportation 2040* to further advance its policies. Active transportation refers to multimodal transportation solutions that connect people of all ages and abilities to where they need to go, using active modes such as walking, bicycling and public transit. The Plan's purpose is to advance *Transportation 2040* policies through implementation of active transportation in the Puget Sound region. This Plan seeks to implement active transportation, providing guidance and resources for local jurisdictions in developing their bicycle and pedestrian elements, and describing how the region is working together to support it.

5.3. Kitsap County

The *Kitsap Countywide Planning Policies* (CPPs) strongly support the development of a multimodal transportation system in Kitsap County, particularly in urban areas. They identify both vehicle and passenger-only ferry service as part of the countywide multimodal transportation system, and focus on the landside elements that support ferry service. The CPPs identify ferry terminals as Transportation Hubs where more intensive development is encouraged, and call for measures that allow the terminals to better operate as intermodal transfer points.[23] The *Kitsap County Comprehensive Plan* and prior Kingston-focused planning efforts described in the Background section of the *Kingston Complete Streets Report* have further built upon the CPPs to establish a multimodal vision for the Kingston area and identify specific measures and strategies to achieve that vision.

[20] Puget Sound Regional Council (PSRC), 2009. VISION 2040, December.
[21] Puget Sound Regional Council (PSRC), 2010. Transportation 2040: Toward a Sustainable Transportation System, May.
[22] Puget Sound Regional Council (PSRC), 2014. Active Transportation Plan, May 29.
[23] Kitsap County, 2013. Countywide Planning Policies. Adopted by the Kitsap County Board of Commissioners on November 25.

6. CONCLUSIONS

The major findings and recommendations presented in this report are summarized as follows.

- The Complete Streets projects would provide a complete pedestrian and bicycle network within the study area, as well as green stormwater facilities on some streets, while also providing the facilities and capacity needed to accommodate ferry-generated automobile and truck traffic. Completion of the pedestrian and bicycle grid would also improve transit accessibility.

- With Alternative A, vehicle operations through downtown Kingston would remain the same as existing with continued operation of the couplet. The couplet's design favors the major vehicle flow on SR 104, and vehicles traveling through Kingston to and from the ferry would be relatively unimpeded.

- Alternative B more strongly supports the project goals by physically separating ferry vehicle traffic (via NE 1st Street) from local vehicle and non-motorized traffic. Removal of ferry vehicle traffic from Main Street supports the community's multimodal vision, defined in detail in the community planning efforts leading up to this project. Moving the highway vehicle operation would allow Main Street to be narrowed from four to two vehicle lanes, with the additional width providing opportunity to widen the sidewalks and provide separate bicycle facilities.

- With Alternative B, it is recommended that a traffic signal be installed at the NE 1st Street/Iowa Avenue NE intersection. It would operate at an acceptable level of service, even during peak traffic days, as well as active protection for pedestrian crossings of SR 104. It would also generate gaps in ferry discharge traffic improving the ability for local traffic to turn onto and off of SR 104 during ferry traffic surges. A roundabout would not provide these benefits, and could become congested by ferry queues without manual control to prevent in-roundabout queuing.

- With Alternative B, permitted-protected left-turn phase from westbound NE 1st Street to Iowa Avenue NE, and north-south stop-control at Main Street/ NE West Kingston Road/Iowa Avenue NE, is recommended. These features are expected to provide the most efficient overall operation, and also the most flexibility to accommodate queues. More detailed project-level analysis would be completed to determine the actual design prior to implementation of the project.

- It would be possible to implement a traffic signal solution that provides a similar traffic control function to that of the WSP officers during peak ferry demand conditions when queues extend beyond the ferry holding area. The ferry queue lane at Lindvog Road NE could have its own signal that communicates with vehicle detectors installed downstream, south of NE West Kingston Road/ Iowa Avenue NE. The traffic signal would turn green, allowing upstream queued vehicles to proceed to the ferry toll booths, only when the downstream detectors indicate that queues do not extend past them. Reservation cards would still be needed to prevent ferry queue cutting.

- Removal or reconfiguration of parking spaces resulting from the Complete Streets improvements would increase peak parking utilization, but the area would still have an excess capacity on peak summer Saturdays when typical demand is highest. Parking efficiency could potentially be improved through provision of signage that clearly identifies long-term and short-term parking options in the area. There may also be opportunity to lower the total number of parking spaces removed through reconfiguration of other parking near the affected areas.

- The Complete Streets Project supports and is supported by county, regional and statewide multimodal goals and policies, as well as strategies to encourage more walk-on ferry passengers through improvement of the non-motorized transportation system.

APPENDIX A

LEVEL OF SERVICE DEFINITIONS

Levels of service (LOS) are qualitative descriptions of traffic operating conditions. These levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. Levels of service for this analysis were developed using procedures presented in the *Highway Capacity Manual* (Transportation Research Board, 2010).

Level of service for signalized intersections is defined in terms of delay. Delay can be a cause of driver discomfort, frustration, inefficient fuel consumption, and lost travel time. Specifically, level of service criteria are stated in terms of the average delay per vehicle in seconds. Delay is a complex measure and is dependent on a number of variables including: the quality of progression, cycle length, green ratio, and a volume-to-capacity ratio for the lane group or approach in question. Table A-1 shows the level of service criteria for signalized intersections from the *Highway Capacity Manual.*

Table A-1. Level of Service Criteria

Level of Service	Average Delay Per Vehicle	General Description
A	Less than 10.0 Seconds	Free flow
B	10.1 to 20.0 seconds	Stable flow (slight delays)
C	20.1 to 35.0 seconds	Stable flow (intermediate delays)
D	35.1 to 55.0 seconds	Stable flow (intermediate delays)
E	55.1 to 80.0 seconds	Unstable flow (approaching forced flow)
F	Greater than 80.0 seconds	Forced flow (jammed)

Source: Transportation Research Board, Highway Capacity Manual, 2010.

For unsignalized intersections, level of service is based on the average delay per vehicle for each turning movement. The level of service for a two-way, stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. Delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. The delay at an all-way, stop-sign (AWSC) controlled intersection is based on saturation headways, departure headways, and service time using procedures in *Chapter 17 – Unsignalized Intersections, Applications – AWSC Intersections* of the *Highway Capacity Manual 2010* (Transportation Research Board (TRB), 2010). Table A-2 shows the level of service criteria for unsignalized intersections from the *Highway Capacity Manual*.

Table A-2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Delay (seconds per vehicle)
A	Less than 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

Source: Transportation Research Board, Highway Capacity Manual, 2010.

Appendix B.3. Stormwater

KINGSTON COMPLETE STREETS

STORMWATER TECHNICAL MEMORANDUM

May 2016 | Draft Report

Consulting Engineers

STORMWATER TECHNICAL MEMORANDUM

May 2016 | Draft Report

Prepared for:

MacLeod Reckord

Prepared by:

KPFF Consulting Engineers
1601 Fifth Avenue, Suite 1600
Seattle, WA 98101
(206) 622-5822
KPFF Job No. 114523

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Table of Contents

1. Introduction 1
2. Process 1
Previous Studies 1
Site Assessment 2
Existing System Constraints /Problem Areas 4
3. Alternatives Identification 8
4. Regional Opportunities 11
5. Conclusions 12

List of Figures

Figure 1 – Soils 3
Figure 2 –Drainage Basins 4
Figure 3 – Existing Conveyance Systems 5
Figure 4 – Locations of Site Constraints 7

List of Tables

Table 1 – LID Opportunities 9

Appendices as Supplemental Data (not included in this report)

Appendix A – Qualitative Conveyance Evaluation
Appendix B – Bioretention Sizing
Appendix C – Hydrologic Modeling of Bannister Road Storm Drainage Diversion
Appendix D – Hydrologic Modeling of SR 104 Storm Drainage Diversion
Appendix E – Basis of Cost Estimating Stormwater and Utility Infrastructure

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1. Introduction

The purpose of this memorandum is to document the assessment, evaluation, and preliminary calculations to support the feasibility of concepts for stormwater management incorporated in the Kingston Complete Streets Project. The intent of this effort, with respect to stormwater management, is to build upon earlier work by Kitsap County including the *Kingston LID Stormwater Retrofit Study* (2012).

Kitsap County has embraced the concept of treating water as a critical resource and supports innovative solutions for integrating Low-Impact Development (LID) in the design of roadways. The scope of the analyses performed included site assessment, review of existing drainage systems, both natural and manmade, definition of basin boundaries, a qualitative analysis of the existing systems to identify capacity issues, and feasibility of concepts. In addition, what could be considered stand-alone projects have been identified to address specific drainage issues that were identified as part of the assessment.

2. Process

The stormwater evaluation began with the review of previous studies, survey and base mapping, site review and research, and input from stakeholders, business owners, and residents. Earlier studies have identified LID Best Management Practices (BMPs) that are suitable for the Kingston Urban Village Center (UVC) area. This work built upon the *Kingston LID Stormwater Retrofit Study* and considered the findings and recommendations from that report when looking at the specific street improvement projects. In addition, stand-alone projects have been identified to address specific drainage issues discovered in the process of evaluation.

Data collection included topographic survey and GIS data to define the existing drainage networks and delineate basins. NRCS Soils Maps were the basis for determining suitability of soils for infiltration, as site specific geotechnical data was not available for this study. Site visits were performed to validate the survey and GIS information, to evaluate the terrain, and to identify natural features and vegetation that may inform the design.

Input was solicited from the community through a number of outreach meetings. Historical information and anecdotal data not otherwise available was obtained through this process.

PREVIOUS STUDIES

Existing documents and studies prepared by and for Kitsap County informed the study and include:

- *Downtown Kingston Master Plan Study (2009)*
- *Kingston LID Stormwater Retrofit (2012)*
- *Low Impact Development Guidance Manual – Kitsap County (2009)*
- *Kitsap County Green Streets Plan (2014)*
- *Roadside Ditch and Shoulder Water Quality Enhancement Plan (2012)*

SITE ASSESSMENT

Site assessment for design of LID stormwater solutions includes analysis of the topographic, geologic, vegetative, and hydrologic features of a site that are conducive to LID as well as those features that pose risks or challenges.

Topography

Situated on the north side of Appletree Cove, Kingston is located on the shoreline of west Puget Sound. The topography generally slopes from the northeast to the southwest across the UVC with grades typically on the order of 5 percent or greater. These slopes are considered to be at the high end or exceeding desirable slopes for LID facilities such as bioretention or porous pavement. Therefore, design of facilities in areas of these slopes will need to address this with terracing or subgrade impermeable dams. Beyond the residential areas located to the northeast of the business core, the upland areas are largely forested, although development continues to expand to the north. These upland areas contribute runoff toward downtown. The undeveloped wooded areas flow through a ravine via an unnamed creek that enters a closed conveyance system near Iowa Street, which remains enclosed within the study area. The remaining tributary areas are developed sites and drain to the conveyance systems of Kingston.

The most significant topographic feature of the area and the one that poses the greatest concern is the exposed bluff north of North Beach Park along the waterfront. It is prone to subsidence, and restrictions have been made to vehicular access on Washington Boulevard. Infiltration of stormwater in the vicinity of the bluff is not recommended as it could contribute to the instability. Future design of street improvements in the vicinity of this slope will require geotechnical analysis to determine the appropriate setback from the bluff for any infiltration.

Soils

While Kingston is a highly urbanized area, the natural soils throughout the area are composed of outwash soils according to the County GIS and NRCS data. These soils are ideal for infiltrating stormwater. The NRCS soils classification for a majority of the area in the study is Indianola, which is characterized by sandy soils to significant depths consisting of glacial outwash deposits.

Geotechnical explorations were not performed as part of this study. Subsequent design will need to collect this data to confirm actual design rate and depth to groundwater for specific locations. Based on the information available it is not anticipated that shallow groundwater is present for a majority of the study area, and concepts that promote infiltration of runoff would be considered highly desirable through the study area except near the bluff described above.

Figure 1 shows the soil types within the study area. Types A and B are outwash soils which support infiltration. Type C soils have a more limited capacity for infiltration, but these soils are confined to the properties belonging to the Port of Kingston.

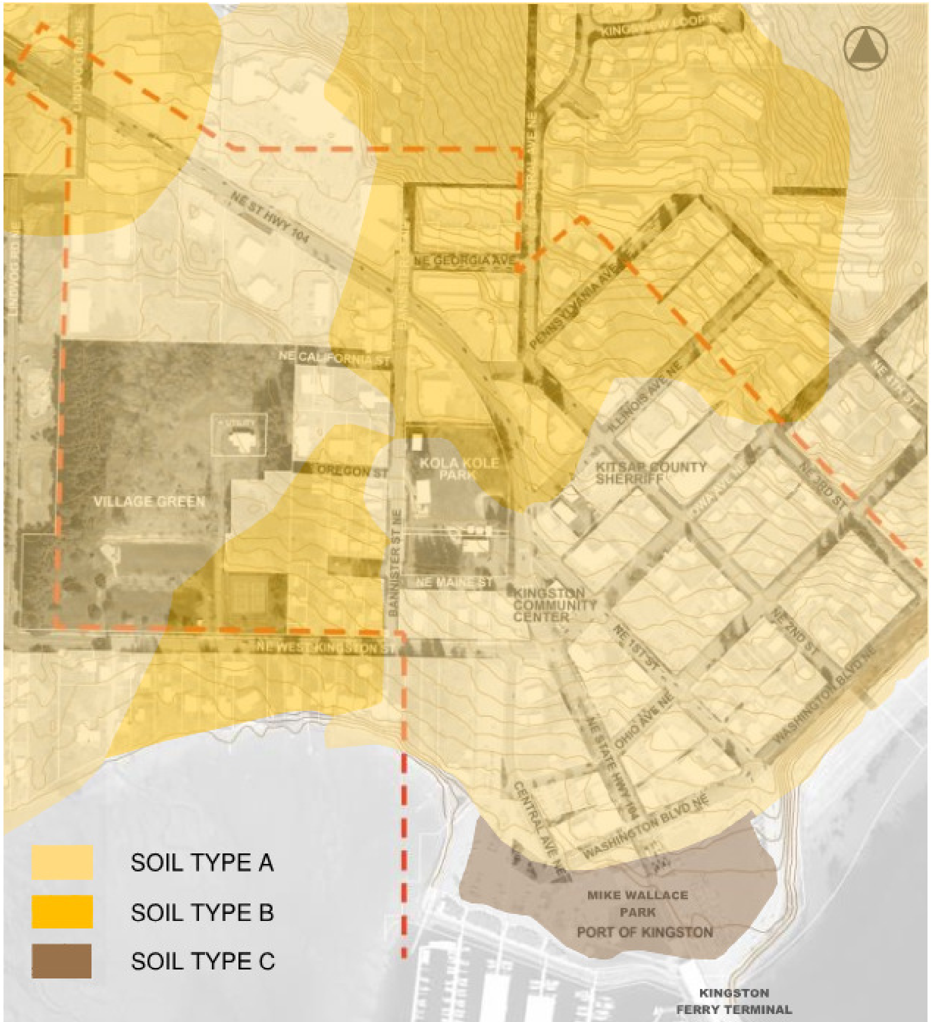


Figure 1 – Soils

Water Bodies and Critical Areas

Within the study area itself there are no known wetlands and the only water body is an unnamed creek that flows through the Village Green Park crossing Northeast West Kingston Road through a culvert at the Lindvog Road Northeast intersection and discharging to Appletree Cove. In the upper reaches the creek has been enclosed in a piped conveyance system. The original headwaters of the creek were located in what is now the Kingston Food Market parking lot, so the basin area itself is relatively small in scale. That said, it has led to flooding problems for properties along the waterfront.

There has been anecdotal discussion of a smaller historic creek located near 10851 Northeast West Kingston Road. It is now a piped outfall that conveys runoff from Bannister Road to the north, but has caused ongoing drainage issues for this property.

Vegetation

The purpose of noting the existing vegetation is that it is beneficial to retain established vegetation, particularly trees, to the extent possible. Clearing of vegetation leads to increased runoff, which in turn leads to increased erosion. This is largely an urbanized area so there will not be large areas of clearing; however, there are existing street trees within the right-of-way. Design solutions should focus on maintaining these trees and developing grading plans to accommodate them in the design.

Basin Delineation

Basins were defined based on review of the existing drainage conveyance systems and outfalls to Puget Sound. In total, six basins have been identified, as illustrated in Figure 2 below.

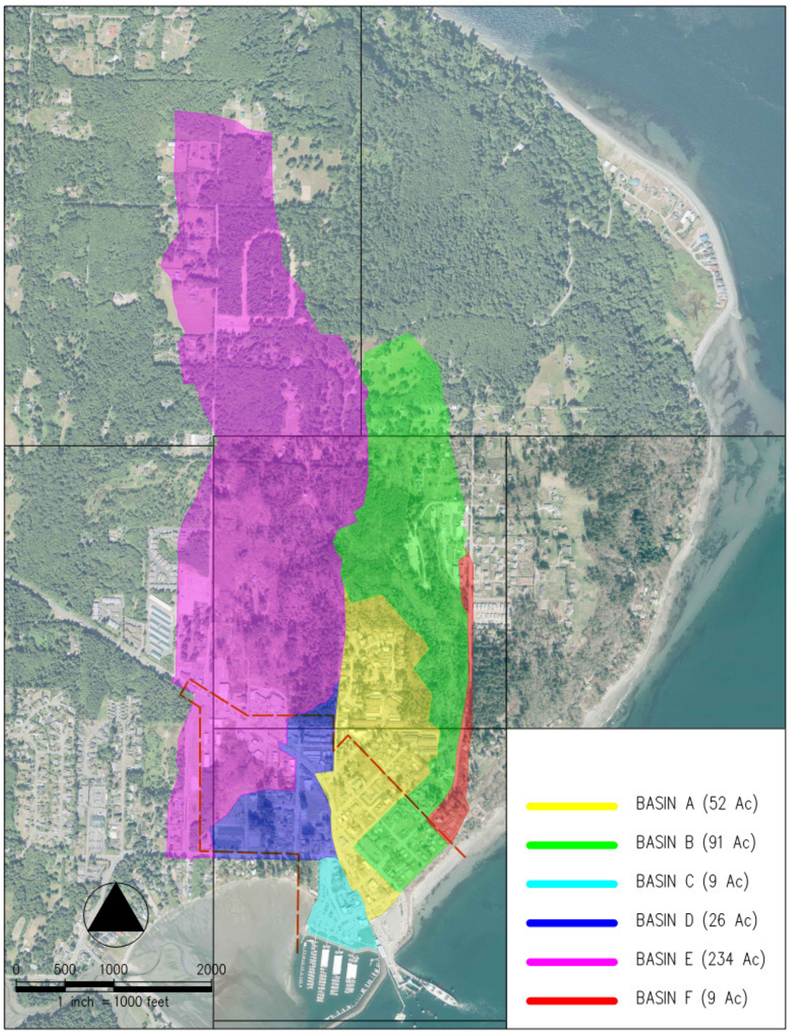


Figure 2 –Drainage Basins

EXISTING SYSTEM CONSTRAINTS /PROBLEM AREAS

There are a number of areas where there are known issues that will have a bearing on the selection of LID solutions as well as overall direction on the decisions for drainage improvements. Alternatives identified for this study have considered impacts to these areas so as not to exacerbate any known problems.

Review of the existing basin boundaries and available survey and GIS indicates that the existing conveyance system located in Main Street between Northeast Maine Street and the outfall near the ferry terminal does not meet the current standards for capacity. Fifty-two acres of urbanized land drains to this 12-inch storm drain, which lacks the capacity for an area of this size. There are a handful of detention systems in the upstream network which would help to reduce peak flows during storms; however, the basin as a whole does not have a comprehensive system of flow control facilities to warrant an outfall of this size. The LID opportunities identified in this report would help, but the trunk line should be upgraded to a larger diameter regardless. Replacement of this line should be considered a priority to be included as part of the implementation of Complete Streets projects. There are a number of ways this could be accomplished, but specific implementation measures are dependent upon project prioritization and funding.

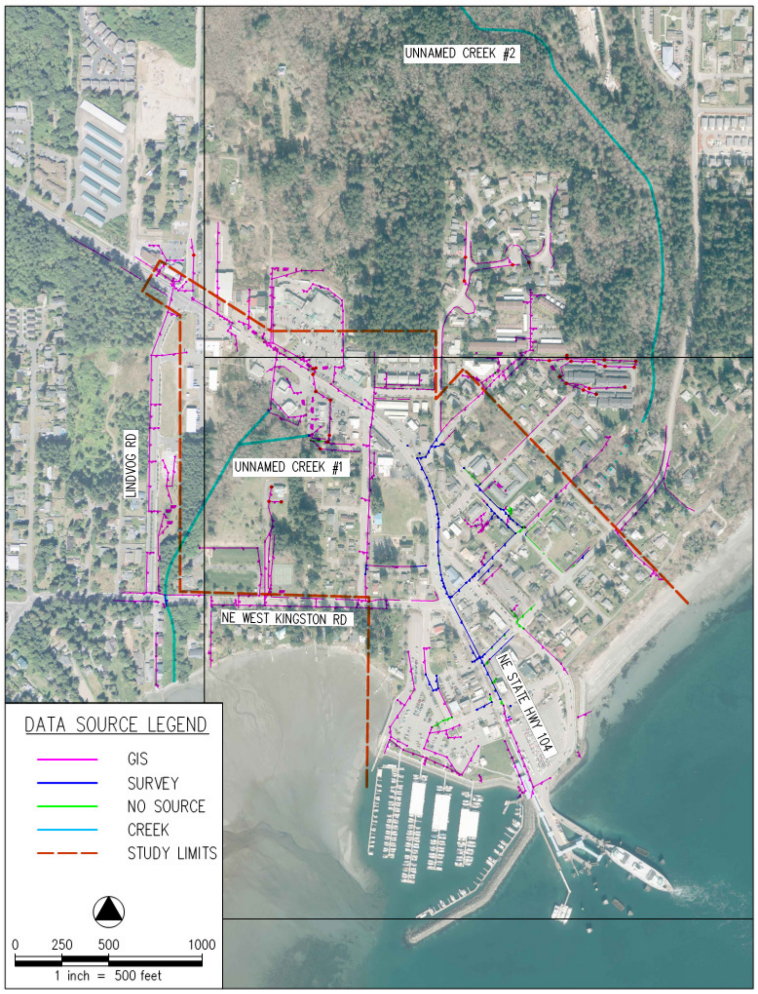


Figure 3 – Existing Conveyance Systems

Flooding

There has been anecdotal evidence of flooding problems at two properties along the south side of Northeast West Kingston Road. The properties are located at 10809 and 10851 Northeast West Kingston Road. They are situated at the low-lying elevations along the waterfront. The first property is affected by the unnamed creek that flows from the north through Village Green Park and passes through this property. It is probable the problems stem from channel geometry and reduced slopes as the creek flows through a flatter gradient approaching Appletree Cove.

The second property is located two parcels to the east. Storm drainage from Northeast West Kingston Road flows through a 30-inch conveyance within an easement on the property. Issues that have been reported include ponding in the roadway as well as flooding on the property. The ponding issue may be attributed to the grates of the drainage structures in the roadway being set too high. Future roadway improvements can easily rectify this. The cause of flooding on the property itself is likely similar to the issue at the other property. The locations of these properties at low-lying areas near the waterfront will tend to make them prone to flooding issues.

The owners at10809 Northeast West Kingston Road have been in contact with both Kitsap County staff as well as Department of Fish and Wildlife to look at opportunities to make improvements to the creek. This would be the most beneficial option. The majority of the basin area tributary to this outfall is beyond the Kingston Complete Streets study area. Any LID improvements incorporated into selected projects from this study will have a limited impact on the flooding at this location. Efforts to reduce flooding at this location should focus on the problem area.

There are, however, opportunities to address the drainage at 10851 Northeast West Kingston Road since the tributary area to that conveyance is within the study area. Concepts are discussed later in the Regional Opportunities section.

Slope Instability

As mentioned above, the bluff along the waterfront adjacent to Washington Boulevard facing east is an ongoing concern for the County. LID that is proposed within the residential areas uphill of this area will need to consider the proximity to this slope. Infiltration of stormwater in this area is strongly discouraged. LID alternatives could be used, but depending upon what is proposed, mitigating measures may be necessary. Bioretention facilities, for example, would still serve a purpose for filtration of runoff, but a geomembrane or other type of liner would be needed to prevent infiltration into the native soils. Underdrain systems would collect the drainage from the facilities to drain runoff to a conventional conveyance system. Future design of street improvements in the vicinity of this slope will require geotechnical analysis to determine the appropriate setback from the bluff for infiltration.

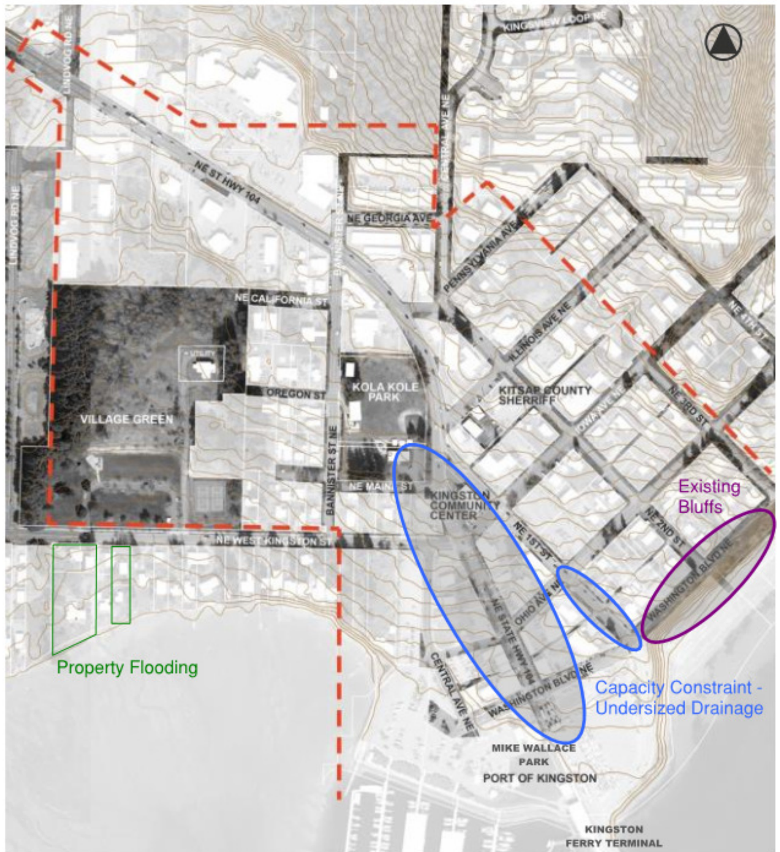


Figure 4 – Locations of Site Constraints

Conveyance System

A qualitative analysis of the existing storm drainage conveyance in the study area was performed to identify system constraints. The basis of this evaluation was the survey and GIS information. Two trunk lines have been identified to lack capacity-based current design standards for conveyance. These systems are located within the WSDOT right-of-way for SR 104, so they were evaluated against the WSDOT design standard for conveyance, which is the 25-year storm event.

SR 104 is a couplet serving the ferry terminal in downtown Kingston. The ferry ingress is also known as Main Street and the egress, Northeast First Street. The conveyance system along Main Street originates in the residential developments along Illinois Avenue Northeast and Pennsylvania Avenue Northeast, beyond the limits of this study. These developments drain south to SR 104 and then to the southwest in an 18-inch storm drain. At the intersection with Northeast First Street, where the couplet begins, the system transitions to a 12-inch-diameter pipe. Reduction in pipe size is not in conformance with design standards, and is an indicator of an undersized system. This system continues as a 12-inch pipe to the outfall. The total tributary area is approximately 52 acres, well in excess of an outfall of this size. Calculations are included in Appendix A.

The second constrained system is the storm drain in Northeast First Street. This is also a 12-inch pipe to its outfall along the northeastern edge of the ferry terminal. The tributary area to this system is 91 acres. Much of that is undeveloped forested areas north of the residential neighborhood between Washington Boulevard Northeast and Iowa Avenue Northeast. The developed portion of this basin amounts to only 40 percent of the total; however, modeled flows exceed the capacity of the 12-inch outfall.

Recommendations for replacing these two systems are dependent upon funding and timing of projects. For example, Projects 1A/2A and 1B/2B are alternatives that evaluate maintaining the ferry ingress/egress as it exists today versus moving the ingress to Northeast First Street and converting Main Street to two-way traffic. Should the Northeast First Street improvements occur prior to Main Street, the drainage can be reconfigured to divert the stormwater from the system in Main Street. Reconstruction of Northeast First Street would include an entirely new conveyance system, and an upgrade could occur at that time providing relief from the system in Main Street. Alternatively, should Main Street be improved first, the conveyance system would be replaced at that time to accommodate the entire basin. Challenges will remain to replace the pipe to the ultimate outfall because it is located beneath the ferry holding lanes. Coordination with Washington State Ferries would be necessary.

3. Alternatives Identification

As stated previously, the Kingston LID Stormwater Retrofit identified several alternatives for BMPs for implementing LID stormwater management throughout the Kingston area. These included:

- Bioretention, whether cells (rain gardens), swales, or proprietary boxed tree planters.
- Porous pavement.
- Narrow streets.
- Amended soils – by tilling compost into existing soils, the capacity of soils to retain water and remove pollutants through cation exchange is increased. This measure would be included in a roadside ditch water quality enhancement retrofit in addition to plantings.

The *Kingston LID Stormwater Retrofit* study also included Cisterns as a BMP. These, however, are better suited to homes and buildings and not street improvement projects, so they have not been carried forward in this analysis. Not identified earlier but encouraged with the Complete Streets projects is retaining existing vegetation, particularly established trees, where possible.

Since the time of that report there have been technologies and products that have been developed that have received approval through the Department of Ecology (DOE) for treatment of stormwater. In particular, Filterra Bioscape™ is a product being used with increasing success. This product is comprised of the same material that is used in the Filterra boxed tree planters that had been identified in the retrofit study, except that they are not restricted to an application of a single unit the size of a catch basin. The key advantage of this material is the very high infiltration capacity of the proprietary soil medium. This mix has a design infiltration rate of 96 inches per hour as compared to the rate of the standard bioretention soil of 2 inches per hour.

The traditional guidance for LID is to take a decentralized approach to treatment of runoff, which is to provide smaller facilities treating runoff at the source, as opposed to fewer, larger facilities placed at the end of a piped system. This product with its high infiltrative capacity allows for the design of a system that can treat a larger area while still maintaining a relatively small footprint. This has been done to great success in the town of Manchester where the County's SSWM Division constructed a multi-purpose Stormwater Park. It provides open space for the community while providing treatment of the stormwater runoff in a landscaped environment. Furniture and other elements can be included as desired to make the space functional at a number of levels.

Below is a table of the projects that were evaluated in the study with notes regarding opportunities for incorporation of LID elements. The projects may or may not have identified all of these features in this study and can be further evaluated for incorporation in subsequent design.

Table 1 – LID Opportunities

PROJECT	NAME	OPPORTUNITIES
1A	SR 104	This project contains opportunities for rain gardens to be used near the intersections of SR 104 with NE 2nd St and Illinois Ave. This project also allows for proprietary boxed tree planters to be used in locations along Main St. south of Iowa Ave NE.
1B	SR 104	This project contains the same opportunities as project 1A with this additional opportunity to add rain gardens within the vegetated strip on the east side of SR 104 between NE 1st St and NE Iowa.
2A	NE 1ST STREET	This project has the opportunity to install several boxed tree planters adjacent to the roadway on either side at the upstream end of each intersection along NE 1st St/ with the exception of the NW corner of NE 1st St. and Washington Boulevard.
2B	NE 1ST STREET	There are no LID opportunities for this project due to the lack of space between the roadway curb lines and the right of way.
3A	WASHINGTON BLVD NE - BTN MAIN ST + NE 1ST ST	Pervious pavements can be used for both the roadway and sidewalks. Boxed tree planters and Bioretention swales can be located along the south side of the street at the ends of each bank of parking stalls.
3B	WASHINGTON BLVD NE - BTN MAIN ST + NE 1ST ST	Pervious pavement for the entire roadway section is an option for this project. As well as boxed tree planters and Bioretention at the end of each bank of parking stalls along the south side of Washington Blvd., though not as great as option 3A.
4A	WASHINGTON BLVD NE - BTN CENTRAL AVE NE + MAIN ST	Opportunity to install a boxed tree planter along the south curb of Washington Blvd east of the Central Ave NE.
4B	WASHINGTON BLVD NE - BTN CENTRAL AVE NE + MAIN ST	Opportunity to install a boxed tree planter along the south curb of Washington Blvd east of the Central Ave NE between the crosswalk and the curb bulb for parking.
5B	WASHINGTON BLVD NE - BTN MAIN ST + NE 1ST ST	Potential for boxed tree planter installation at the south end of the mixing zone as the roadway narrows along the west curb line. Bike lane allows maintenance for the vegetated buffer possible meaning this location can accommodate street trees as well.
6	WASHINGTON BLVD - BETWEEN NE 1ST + NE 3RD STREET	Boxed tree planters are possible along this corridor along the north side of Washington Blvd provided that they are connected to a conveyance system which takes all water towards NE 1st St.
7	CENTRAL AVE NE + OHIO AVE NE - WEST OF MAIN ST	Boxed tree planters can be installed along the south curb of Ohio Ave at the intersection of Ohio Ave NE and Central Ave NE.
8	OHIO AVE NE - BETWEEN MAIN STREET + NE 1ST ST	This project could include a boxed tree planter in the vegetated buffer at the northeast corner of Ohio Ave NE and Main St. To do this, the roadway would need to be graded such that water would flow to this location.

PROJECT	NAME	OPPORTUNITIES
9	NE WEST KINGSTON ROAD	Bioretention can be included in the 10-foot section along the north side of NE West Kingston Rd up to the intersection with Central Ave. Amended soils can also be placed in the 10-foot section to reduce runoff. This work should include or work with the current rain garden. Boxed tree planters can also be installed along the north curb line of NE West Kingston Road.
10	NE BANNISTER ST	Potential for boxed tree planter installation along the east curb line of NE Bannister St and at mid-block curb bulbs. Potential for a bioretention swale or amended soils between the west sidewalk and property lines.
11	NE MAINE ST	Supplement the existing bioswale to the west by adding amended soils to the ditch or extending the current bioswale to NE Bannister St.
12	NE OREGON ST	Potential for pervious pavement use on the south sidewalk.
13	NE CALIFORNIA ST	Project has potential for a bioswale or amended soils at the end of the street in conjunction with the trail access to village green. Potential for boxed tree planters on the south side of NE California St near Bannister St.
14	NE GEORGIA AVE - BANNISTER ST TO CENTRAL AVE NE	Bioswale is possible between the back of the north sidewalk (if grades allow) and the ROW. Amended soils are possible for use along the south side of NE Georgia Ave.
15	NE CENTRAL AVE + NE PENNSYLVANIA + NE 2ND ST	Bioretention is possible between the sidewalk and residential properties along the south side of NE Pennsylvania Ave. Amended soils may be used inside the 'Y' and along the west side of NE 2nd St and east side of NE central Avenue. Boxed tree planters can also be installed at the corner of NE 2nd St and SR 104.
16	ILLINOIS + IOWA + OHIO AVENUES - BETWEEN 1ST AND 2ND ST NE	The vegetated areas between the south sidewalks and ROW along both Iowa Ave NE and Ohio Ave NE can accommodate the use of amended soils or bioretention swales. A bioretention element is also possible at the southeast corner of Illinois Ave and NE 1st Ave. Due to the low volumes on these roads, permeable pavement can be used in the parking lanes.
17	ILLINOIS AVE NE - NE OF 2ND ST	A bioretention swale can be placed along the north side of Illinois Ave NE as well as amended soils.
18	NE 2ND ST	Multiple bioretention elements are possible along the north side of NE 2nd street including bioretention swales, and amended soils. Amended soils may be used in the vegetated areas on both sides between Ohio Ave NE and Washington Blvd. The south curb can also accommodate a boxed tree planter near the intersection of NE 2nd St and Ohio Avenue.
19	IOWA AVE NE - NE 2ND TO NE 3RD ST	A bioswale along the length of Iowa Ave NE is possible on the south side of the roadway while amended soils can be used in the vegetation buffer on the north side. Boxed tree planters can also be placed along the north curb line in relevant locations.
20	NE 3RD ST + OHIO AVE NE - NE OF 2ND ST	Amended soils can be used along both sides of NE 3rd St as well as along the north curb of Ohio Ave NE. The north side of Ohio Ave NE can also accommodate boxed tree planters. Narrowing NE 3rd St, if parking is not needed, would also aid runoff.

4. Regional Opportunities

In addition to the LID measures carried over from the retrofit study, opportunities to address problems in the study area using a more comprehensive approach were identified. Potential improvements included re-routing the Bannister Road and SR 104 storm drainage systems to alleviate drainage constraints while treating the runoff.

Bannister Road Storm Drainage Diversion

Drainage flows from the north along Bannister Road where it turns to the west before turning south once again a few hundred feet. The conveyance passes through the parcel at 10851 Northeast West Kingston Road before discharging to Appletree Cove. As mentioned earlier, there is a history of flooding on this property. This alternative looked at the feasibility of directing the drainage from Bannister Road to the east rather than west as it currently does. This will significantly reduce the flows to this outfall reducing the nuisance flooding at this property. Stormwater would be directed to Central Avenue Northeast where it would drain south toward the Port of Kingston property.

At this point, an opportunity was identified to provide water quality treatment for these concentrated flows. Two alternatives were evaluated: a proprietary filtration media (Filterra Bioscape) and a sand filter vault. The former would be a concept similar to the Stormwater Park that was developed in Manchester. It would be a high-capacity water treatment system that can be designed to provide the dual purpose of creating open space while treating stormwater. It would be comprised of a system of conveyance pipes and flow control features to direct the concentrated flows through concrete structures that would be filled with the proprietary filtration soil media that removes pollutants. The media support the growth of plants, so it is effectively a bioretention facility that is able to support larger flows due to the high infiltrative capacity of the media.

The second alternative considered was a sand filter vault. This is a standard treatment BMP. It is simply an underground precast concrete vault that has an 18-inch layer of sand placed in the bottom with a network of underdrain pipes beneath the sand. Stormwater enters the vault and drains vertically through the sand layer. Pollutants are filtered out in the process.

Preliminary hydrologic modeling and sizing of both alternatives was performed. Options looked at treating stormwater only from County roadways as well as retrofit of the Port parking lots where feasible to treat their runoff as well. Consolidation of the stormwater system to reduce the number of outfalls would be desirable, but no new outfalls should be constructed. The Filterra Bioscape concept would have a significantly smaller footprint than a sand filter vault while providing the same level of treatment.

The study team met with Kitsap County and Port of Kingston officials to discuss the alternatives. The Port provided insight on the critical operations of the marina parking lot. For example, a suitable location for a sand filter vault would be near the boat launch. However, construction, and to a certain extent, maintenance of the sand filter vault, would have significant impacts to the operations and revenue at the Port and would not be acceptable to the Port. The Stormwater Park concept was perceived as having a greater value and potential.

There was tacit support for ongoing discussions of a potential combined facility to treat runoff from both the County and Port areas. The facility would be located in an easement on the Port property but owned and maintained by the County. Future discussions between the Port and County would be needed to work out agreements as well as define the areas where a facility such as this could be located. Reduction of parking spaces is not preferred as it is a significant revenue source for the Port. The existing green spaces that are located at the water's edge of Mike Wallace Park were identified as potential locations. The landscaped areas could be reworked to provide a stormwater park that can still provide public space. The location of the Filterra Bioscape facilities should not fragment the area of the park closer to the ferry terminal or impede the use of the adjacent concrete pad and tent space. Port officials identified the grassed area at the very west end of the park between the sidewalk and wall as a potentially suitable area as well.

SR 104 Storm Drainage Diversion

A similar analysis was performed for SR 104, and options evaluated for both scenarios that upgraded the conveyance systems in Main Street and Northeast First Street as described earlier. A sand filter vault was not considered due to the excessive size requirements and lack of available space.

If the drainage diversion from Main Street to Northeast First Street was implemented, a suitable end-of-pipe location for a treatment facility would be near the intersection of Northeast First Street and Washington Boulevard Northeast. There is a current Port of Kingston project to create a park on the south side of Washington Boulevard Northeast. A linear configuration of a Filterra Bioscape system could be installed on the adjacent parcel, separate from, but along the south edge of that park. This location would require relocation of Washington State Ferries’ infrastructure and equipment that is located here, and may prove problematic for Port/WSF future lease negotiations.

Another potential location would be near the intersection of Main Street and Washington Boulevard Northeast where the existing toll booths are located. The timing for construction of this project would most reasonably occur when and if the ferry ingress is moved to Northeast First Street. Space is more limited in this area and any combined stormwater treatment/public space facility would need to be balanced against the other operational needs for transit, non-motorized, and motorized users.

The two concept locations for SR 104 have more constraints and limitations than the Bannister Road Diversion and would not provide the benefit for treatment of runoff from Port property as the Bannister diversion would.

5. Conclusions

The major findings of this memorandum are as follows:

- The Complete Streets program will provide significant opportunities to implement LID stormwater concepts in accordance with the goals and policies of Kitsap County and as identified in previous studies.
- As projects are prioritized and funded, opportunities to address deficiencies in the larger regional infrastructure should be incorporated.
- There are also potential partnering opportunities with the Port of Kingston to implement projects of a shared common interest in providing stormwater improvements while creating improved public spaces at the same time.

Appendix A

Qualitative Conveyance Evaluation

Evaluation of Conveyance Systems

A qualitative analysis of the existing conveyance systems was performed to identify constraints that exist today. This was based upon a review of survey data with gaps filled in using GIS data. The conveyance system in SR 104 is an 18-inch pipe at the intersection of NE 2nd Street. Just past the intersection of NE 1st Street it transitions to a 12-inch pipe and the system remains that size to the outfall beneath the ferry terminal. Both of these pipes were checked for capacity.

There is also a 12-inch outfall located on the north side of the ferry terminal. This outfall conveys runoff from a basin 91 acres in size and was therefore checked as well.

Land cover for the basins was estimated based on aerial imagery and measurements in CAD. All soils are outwash within these two basins. Modeling was performed using MGS Flood. I time step interval of 15-minutes was used which is typical when modeling for conveyance systems. Capacity checks were performed using FlowMaster which is based on Manning's equation. Supporting calculations are included herein.

Results indicate that all pipes lack capacity, although the 18-inch pipe is only 1 cfs over. A more detailed analysis accounting for upstream infiltration and detention facilities may show that this portion of the conveyance is adequate. The two 12-inch outfalls are extremely undersized and should be upgraded.

Basin Land Cover and Modeled Flows and Capacities

BASIN	Outwash (Ac)			25-year Flow (cfs)	Capacity
	Forest	Lawn	Impervious		
A – at 18" Limits	7.19	8.17	17.33	11.29	10.18
A - at 12" Outfall	11.5	12.94	27.37	17.83	3.45
B - at 12" Outfall	53.01	18.7	18.82	13.59	3.45

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 200410007
Project Simulation Performed on: 03/05/2016 6:10 PM
Report Generation Date: 03/05/2016 6:10 PM

Input File Name: BasinA.fld
Project Name: Kingston Complete Streets
Analysis Title: Basin A
Comments: Determine25-year peak flows at the limits of the 18-inch conveyance and at the end of the Baisn for the 12-inch outfall

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 3

Full Period of Record Available used for Routing
Precipitation Station : 95004005 Puget West 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) ***************

********************** **WATERSHED DEFINITION** ***********************

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	1.000	84.500	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	1.000	84.500	

----------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Null ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000

Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	1.000
Subbasin Total	1.000

----------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2

---------- Subbasin : Subbasin 1- 18" ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	7.190
Outwash Pasture	0.000
Outwash Grass	8.170
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	17.330
Subbasin Total	32.690

---------- Subbasin : Subbasin 2 - 12" ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	11.500
Outwash Pasture	0.000
Outwash Grass	12.940
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	27.370
Subbasin Total	51.810

************************* **LINK DATA** *******************************

----------------------SCENARIO: PREDEVELOPED
Number of Links: 0

************************* **LINK DATA** *******************************

----------------------SCENARIO: POSTDEVELOPED

Number of Links: 1

Link Name: Link
Link Type: Copy
Downstream Link: None

**********************FLOOD FREQUENCY AND DURATION STATISTICS*******************

---------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

---------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 2
Number of Links: 1

********** **Subbasin: Subbasin 1- 18"** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	6.767
5-Year	8.660
10-Year	10.010
25-Year	**11.285**
50-Year	14.548
100-Year	16.940
200-Year	17.435

********** **Subbasin: Subbasin 2 - 12"** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	10.687
5-Year	13.677
10-Year	15.811
25-Year	**17.827**
50-Year	22.976
100-Year	26.755
200-Year	27.537

********** Link: Link ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)
Tr (yrs) Flood Peak (cfs)

==

2-Year	17.454
5-Year	22.337
10-Year	25.821
25-Year	29.111
50-Year	37.524
100-Year	43.695
200-Year	44.972

***********Groundwater Recharge Summary *************
Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Null	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin 1- 18"	4727.432
Subbasin: Subbasin 2 - 12"	7518.306
Link: Link	0.000
Total:	12245.740

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.000 ac-ft/year, Post Developed: 77.505 ac-ft/year

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 200410007
Project Simulation Performed on: 03/05/2016 6:14 PM
Report Generation Date: 03/05/2016 6:14 PM

Input File Name:	BasinB.fld
Project Name:	Kingston Complete Streets
Analysis Title:	Basin A
Comments:	Determine25-year peak flows for 12" outfall located at the north side of the Ferry Terminal

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 3

Full Period of Record Available used for Routing
Precipitation Station : 95004005 Puget West 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) ***************

*********************** WATERSHED DEFINITION ***********************

Predevelopment/Post Development Tributary Area Summary

		Predeveloped	Post Developed
Total Subbasin Area (acres)	1.000	90.530	
Area of Links that Include Precip/Evap (acres)	0.000	0.000	
Total (acres)	1.000	90.530	

----------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Null ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000

Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	1.000
Subbasin Total	1.000

---------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Subbasin - 12" ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	53.010
Outwash Pasture	0.000
Outwash Grass	18.700
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	18.820
Subbasin Total	90.530

************************* **LINK DATA** *******************************

----------------------SCENARIO: PREDEVELOPED
Number of Links: 0

************************* **LINK DATA** *******************************

----------------------SCENARIO: POSTDEVELOPED
Number of Links: 1

--
Link Name: Link
Link Type: Copy
Downstream Link: None

*********************FLOOD FREQUENCY AND DURATION STATISTICS******************

---------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 1
Number of Links: 1

********** **Subbasin: Subbasin - 12"** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.371
5-Year	9.426
10-Year	10.981
25-Year	**13.586**
50-Year	16.628
100-Year	18.407
200-Year	18.953

********** Link: Link ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.371
5-Year	9.426
10-Year	10.981
25-Year	13.586
50-Year	16.628
100-Year	18.407
200-Year	18.953

***********__Groundwater Recharge Summary__ *************
Recharge is computed as input to PerlInd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Null	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Subbasin - 12"	20855.750
Link: Link	0.000
Total:	20855.750

Total Predevelopment Recharge is Less than Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.000 ac-ft/year, Post Developed: 131.998 ac-ft/year

Capacity - 12"

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.05000	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft
Discharge	3.45	ft³/s

Results

Discharge	3.45	ft³/s
Normal Depth	1.00	ft
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.79	ft
Percent Full	100.0	%
Critical Slope	0.05308	ft/ft
Velocity	4.40	ft/s
Velocity Head	0.30	ft
Specific Energy	1.30	ft
Froude Number	0.00	
Maximum Discharge	3.71	ft³/s
Discharge Full	3.45	ft³/s
Slope Full	0.05000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Capacity - 12"

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.79	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.05308	ft/ft

Capacity - 18"

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.05000	ft/ft
Normal Depth	1.50	ft
Diameter	1.50	ft
Discharge	10.18	ft³/s

Results

Discharge	10.18	ft³/s
Normal Depth	1.50	ft
Flow Area	1.77	ft²
Wetted Perimeter	4.71	ft
Hydraulic Radius	0.38	ft
Top Width	0.00	ft
Critical Depth	1.23	ft
Percent Full	100.0	%
Critical Slope	0.05006	ft/ft
Velocity	5.76	ft/s
Velocity Head	0.52	ft
Specific Energy	2.02	ft
Froude Number	0.00	
Maximum Discharge	10.95	ft³/s
Discharge Full	10.18	ft³/s
Slope Full	0.05000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Capacity - 18"

GVF Output Data

Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	1.23	ft
Channel Slope	0.05000	ft/ft
Critical Slope	0.05006	ft/ft

Appendix B

Bioretention Sizing

Bioretention Sizing

Preliminary calculations were performed to provide a concept-level basis for determining the feasibility of incorporating bioretention facilities within the available right of way of any given street. The purpose of the table below is to establish the minimum widths of the bioretention facilities to treat the tributary pavement to the full level meeting Ecology's requirements. These have only ben performed for those streets where bioretention has been identified on the project sheets.

Sizing of bioretention facilities was performed using the procedure outlined the WSDOT HRM supplemental material document titled *Category 2 Selected Emerging Technologies BMPs.*

Size bioretention area and filter bed. The filter bed is sized assuming Darcy's Law:

$$Q = [KA_f(H_t - H_h)]/L$$

where: Q = flow rate into the soil

K = conductivity (coefficient of permeability) of filter bed soil

A_f = surface area of filter bed normal to flow

$H_t - H_h$ = difference in hydraulic head

L = depth of filter medium to saturation.

Since:

$$Q = Vol_{WQ}/T_{drain}$$

$$(H_t - H_h)/L = \text{hydraulic gradient} = D/(H_f + D)$$

where: Vol_{WQ} = runoff treatment volume

T_{drain} = time to drain (drawdown time) = 24 hours for runoff treatment storm selected

D = filter bed depth (2 ft min. recommended)

H_f = average ponding depth above filter bed (6 inches recommended/2 = 3 inches)

K = 3.0 in/hr minimum specified for soil mix; 1.0 in/hr selected for design

Solve for surface area of ponding/filter area:

$$A_f = [(Vol_{WQ}/T_{drain})^*(D)]/\ K(H_f+D)$$

There are a number of details that would need to be worked out in the design phase of a project that will determine the ultimate configuration. The nature of the reconstruction will greatly influence the treatment benefit of a LID system. For example, on the residential streets of Projects 18- 20, the roadway is offset from the centerline of the right of way. Bioretention opportunities have been identified on the side of the road with more available space and opposite the on-street parking where that is proposed. Should the project construction include a total replacement of the roadway pavement, it would be possible to remove the crown in the roadway and drain all pavement runoff to the bioretention facility to maximize the level of treatment. Short of that, the facilities would only treat one-half of the pavement area, which would not be taking advantage of the available right of way.

The analysis has taken a high-level approach to the estimation of available length by accounting for driveway access and grading restriction. During the design phase, accommodations must be made for retaining established trees as well.

The table below validates that where bioretention has been proposed – either as a swale or a rain garden – there is generally sufficient right of way available. A single project (NE Central +

NE Pennsylvania) may be constrained on width, however the shortfall is relatively minor and with more detailed information design features can be incorporated to accommodate the facility.

Bioretention Sizing and Space Feasibility

Project No.	Name	Street Typology	Pavement Width	Pavement Area per Block (Acre)	24hr Treatment Vol (CF)	K_{design} (IN/HR)	Bioretention soil depth D (ft)	H_f (ft)	T_{drain} (HR)	Bottom Area (SF)	Available Length	Min. Width	Available Width
9	NE West Kingston	Shared Use Major	30	0.24	1319	1	2	0.25	24	586	345	7.7	10
11	Maine	Residential	25	0.20	1099	1	2	0.25	24	488	200	8.4	10
13	California	Residential	28	0.22	1209	1	2	0.25	24	537	70	13.7	20
14	NE Georgia	Residential	30	0.24	1319	1	2	0.25	24	586	175	9.3	14
15	NE Central + NE Pennsylvania	Residential	22	0.18	989	1	2	0.25	24	440	275	7.6	6
16	Iowa and Ohio Rain Gardens	Residential	30	0.24	1319	1	2	0.25	24	586	120	10.9	30
17	Illinois Ave NE	Residential	26	0.21	1209	1	2	0.25	24	537	230	8.3	23
18	NE 2nd Street	Residential	33	0.27	1484	1	2	0.25	24	660	240	8.7	14
19	Iowa Ave NE	Residential	33	0.27	1484	1	2	0.25	24	660	120	11.5	14
20	NE 3rd	Residential	25	0.20	1099	1	2	0.25	24	488	200	8.4	20

MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.38
Program License Number: 200410007
Project Simulation Performed on: 03/06/2016 3:34 PM
Report Generation Date: 03/06/2016 3:35 PM

Input File Name: BioRetSizing.fld
Project Name: Kingston Complete Streets
Analysis Title: Bioretention Sizing
Comments: Planning level modeling to determine feasibiliy of treating entire roadway footprint in available right of way.

PRECIPITATION INPUT

Computational Time Step (Minutes): 15

Extended Precipitation Time Series Selected
Climatic Region Number: 3

Full Period of Record Available used for Routing
Precipitation Station : 95004005 Puget West 40 in_5min 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) ***************

********************** **WATERSHED DEFINITION** ***********************

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	1.000	2.280
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	1.000	2.280

----------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1

---------- Subbasin : Null ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000

Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	1.000

Subbasin Total 1.000

---------------------SCENARIO: POSTDEVELOPED

Number of Subbasins: 10

---------- Subbasin : Project 9 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.240

Subbasin Total 0.240

---------- Subbasin : Project 11 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.200

Subbasin Total 0.200

---------- Subbasin : Project 13 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000

User 2	0.000
Impervious	0.220
Subbasin Total	0.220

---------- Subbasin : Project 14 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.240
Subbasin Total	0.240

---------- Subbasin : Project 15 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.180
Subbasin Total	0.180

---------- Subbasin : Project 16 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.240
Subbasin Total	0.240

---------- Subbasin : Project 17 ----------

-------Area(Acres) --------

Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.220
Subbasin Total	0.220

---------- Subbasin : Project 18 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.270
Subbasin Total	0.270

---------- Subbasin : Project 20 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000
User 2	0.000
Impervious	0.200
Subbasin Total	0.200

---------- Subbasin : Project 19 ----------

	-------Area(Acres) --------
Till Forest	0.000
Till Pasture	0.000
Till Grass	0.000
Outwash Forest	0.000
Outwash Pasture	0.000
Outwash Grass	0.000
Wetland	0.000
Green Roof	0.000

User 2	0.000
Impervious	0.270
Subbasin Total	0.270

************************ **LINK DATA** *******************************

----------------------SCENARIO: PREDEVELOPED
Number of Links: 0

************************ **LINK DATA** *******************************

----------------------SCENARIO: POSTDEVELOPED
Number of Links: 10

--
Link Name: Link
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk2
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk3
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk4
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk5
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk6
Link Type: Copy
Downstream Link: None

--

Link Name: New Copy Lnk7
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk8
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk9
Link Type: Copy
Downstream Link: None

--
Link Name: New Copy Lnk10
Link Type: Copy
Downstream Link: None

**********************FLOOD FREQUENCY AND DURATION STATISTICS*******************

----------------------SCENARIO: PREDEVELOPED
Number of Subbasins: 1
Number of Links: 0

----------------------SCENARIO: POSTDEVELOPED
Number of Subbasins: 10
Number of Links: 10

********** Subbasin: Project 9 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Subbasin: Project 11 **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02

5-Year	9.926E-02
10-Year	0.112
25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

********** **Subbasin: Project 13** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** **Subbasin: Project 14** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** **Subbasin: Project 15** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	6.864E-02
5-Year	8.934E-02
10-Year	0.100
25-Year	0.117
50-Year	0.151
100-Year	0.176
200-Year	0.181

********** **Subbasin: Project 16** **********

Flood Frequency Data(cfs)

(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** **Subbasin: Project 17** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** **Subbasin: Project 18** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264
200-Year	0.272

********** **Subbasin: Project 20** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02
5-Year	9.926E-02
10-Year	0.112
25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

********** **Subbasin: Project 19** **********

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264
200-Year	0.272

********** Link: Link ********** Link Outflow 1 Frequency Stats

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Link: New Copy Lnk2 ********** Link Inflow Frequency Stats

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02
5-Year	9.926E-02
10-Year	0.112
25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

********** Link: New Copy Lnk2 ********** Link Outflow 1 Frequency Stats

Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02
5-Year	9.926E-02
10-Year	0.112

25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

********** Link: New Copy Lnk3 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** Link: New Copy Lnk3 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** Link: New Copy Lnk4 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Link: New Copy Lnk4 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)
Tr (yrs) Flood Peak (cfs)

=======================================

2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Link: New Copy Lnk5 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	6.864E-02
5-Year	8.934E-02
10-Year	0.100
25-Year	0.117
50-Year	0.151
100-Year	0.176
200-Year	0.181

********** Link: New Copy Lnk5 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	6.864E-02
5-Year	8.934E-02
10-Year	0.100
25-Year	0.117
50-Year	0.151
100-Year	0.176
200-Year	0.181

********** Link: New Copy Lnk6 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Link: New Copy Lnk6 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	9.153E-02
5-Year	0.119
10-Year	0.134
25-Year	0.156
50-Year	0.201
100-Year	0.235
200-Year	0.241

********** Link: New Copy Lnk7 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** Link: New Copy Lnk7 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	8.390E-02
5-Year	0.109
10-Year	0.123
25-Year	0.143
50-Year	0.185
100-Year	0.215
200-Year	0.221

********** Link: New Copy Lnk8 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264

200-Year 0.272

********** Link: New Copy Lnk8 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264
200-Year	0.272

********** Link: New Copy Lnk9 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264
200-Year	0.272

********** Link: New Copy Lnk9 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	0.103
5-Year	0.134
10-Year	0.151
25-Year	0.176
50-Year	0.227
100-Year	0.264
200-Year	0.272

********** Link: New Copy Lnk10 ********** Link Inflow Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02
5-Year	9.926E-02

10-Year	0.112
25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

********** Link: New Copy Lnk10 ********** Link Outflow 1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	7.627E-02
5-Year	9.926E-02
10-Year	0.112
25-Year	0.130
50-Year	0.168
100-Year	0.195
200-Year	0.201

***********Groundwater Recharge Summary *************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Null	0.000
Total:	0.000

Total Post Developed Recharge During Simulation

Model Element	Recharge Amount (ac-ft)
Subbasin: Project 9	0.000
Subbasin: Project 11	0.000
Subbasin: Project 13	0.000
Subbasin: Project 14	0.000
Subbasin: Project 15	0.000
Subbasin: Project 16	0.000
Subbasin: Project 17	0.000
Subbasin: Project 18	0.000
Subbasin: Project 20	0.000
Subbasin: Project 19	0.000
Link: Link	0.000
Link: New Copy Lnk2	0.000
Link: New Copy Lnk3	0.000
Link: New Copy Lnk4	0.000
Link: New Copy Lnk5	0.000
Link: New Copy Lnk6	0.000
Link: New Copy Lnk7	0.000
Link: New Copy Lnk8	0.000
Link: New Copy Lnk9	0.000
Link: New Copy Lnk10	0.000

Total: 0.000

Total Predevelopment Recharge Equals Post Developed
Average Recharge Per Year, (Number of Years= 158)
Predeveloped: 0.000 ac-ft/year, Post Developed: 0.000 ac-ft/year

***********Water Quality Facility Data *************

---------------------SCENARIO: PREDEVELOPED

Number of Links: 0

---------------------SCENARIO: POSTDEVELOPED

Number of Links: 10

********** Link: Link **********

Basic Wet Pond Volume (91% Exceedance): 1319. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1979. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 108.49
Inflow Volume Including PPT-Evap (ac-ft): 108.49
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 108.49
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk2 **********

Basic Wet Pond Volume (91% Exceedance): 1099. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1649. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 90.41
Inflow Volume Including PPT-Evap (ac-ft): 90.41
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 90.41
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk3 **********

Basic Wet Pond Volume (91% Exceedance): 1209. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1814. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 99.45
Inflow Volume Including PPT-Evap (ac-ft): 99.45
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 99.45
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk4 **********

Basic Wet Pond Volume (91% Exceedance): 1319. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1979. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 108.49
Inflow Volume Including PPT-Evap (ac-ft): 108.49
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 108.49
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk5 **********

Basic Wet Pond Volume (91% Exceedance): 989. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1484. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 81.37
Inflow Volume Including PPT-Evap (ac-ft): 81.37
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 81.37
Secondary Outflow To Downstream System (ac-ft): 0.00

Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk6 **********

Basic Wet Pond Volume (91% Exceedance): 1319. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1979. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 108.49
Inflow Volume Including PPT-Evap (ac-ft): 108.49
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 108.49
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk7 **********

Basic Wet Pond Volume (91% Exceedance): 1209. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1814. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 99.45
Inflow Volume Including PPT-Evap (ac-ft): 99.45
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 99.45
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk8 **********

Basic Wet Pond Volume (91% Exceedance): 1484. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 2226. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 122.05
Inflow Volume Including PPT-Evap (ac-ft): 122.05
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 122.05

Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk9 **********

Basic Wet Pond Volume (91% Exceedance): 1484. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 2226. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.04 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 122.05
Inflow Volume Including PPT-Evap (ac-ft): 122.05
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 122.05
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

********** Link: New Copy Lnk10 **********

Basic Wet Pond Volume (91% Exceedance): 1099. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 1649. cu-ft

15-Minute Timestep, Water Quality Treatment Design Discharge
On-line Design Discharge Rate (91% Exceedance): 0.03 cfs
Off-line Design Discharge Rate (91% Exceedance): 0.02 cfs

Infiltration/Filtration Statistics--------------------
Inflow Volume (ac-ft): 90.41
Inflow Volume Including PPT-Evap (ac-ft): 90.41
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 90.41
Secondary Outflow To Downstream System (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered)/Total Volume: 0.00%

***********Compliance Point Results *************

Scenario Predeveloped Compliance Subbasin: Null

Scenario Postdeveloped Compliance Link: Link

*** **Point of Compliance Flow Frequency Data** ***
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.381	2-Year	9.153E-02
5-Year	0.496	5-Year	0.119

10-Year	0.558	10-Year	0.134
25-Year	0.650	25-Year	0.156
50-Year	0.839	50-Year	0.201
100-Year	0.977	100-Year	0.235
200-Year	1.006	200-Year	0.241

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

**** **Flow Duration Performance** ****

Excursion at Predeveloped 50%Q2 (Must be Less Than 0%):	-99.9%	PASS
Maximum Excursion from 50%Q2 to Q2 (Must be Less Than 0%):	-99.9%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	-91.7%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.0%	PASS

MEETS ALL FLOW DURATION DESIGN CRITERIA: PASS

**** **LID Duration Performance** ****

Excursion at Predeveloped 8%Q2 (Must be Less Than 0%):	-91.7%	PASS
Maximum Excursion from 8%Q2 to 50%Q2 (Must be Less Than 0%):	-91.7%	PASS

MEETS ALL LID DURATION DESIGN CRITERIA: PASS

Appendix C

Hydrologic Modeling of Bannister Road Storm Drainage Diversion

BANNISTER DIVERSION ANALYSIS

The Bannister Road Diversion is a concept that was identified to alleviate flooding that has been reported on private properties along West Kingston Road where a storm drain system outfalls to Appletree Cove. Runoff from approximately 14 acres is conveyed along Bannister Road which drains to this outfall. The concept is to route the conveyance from the intersection of Bannister Road and West Kingston Road east to Central Avenue before turning south through the marina parking lot which is Port of Kingston property.

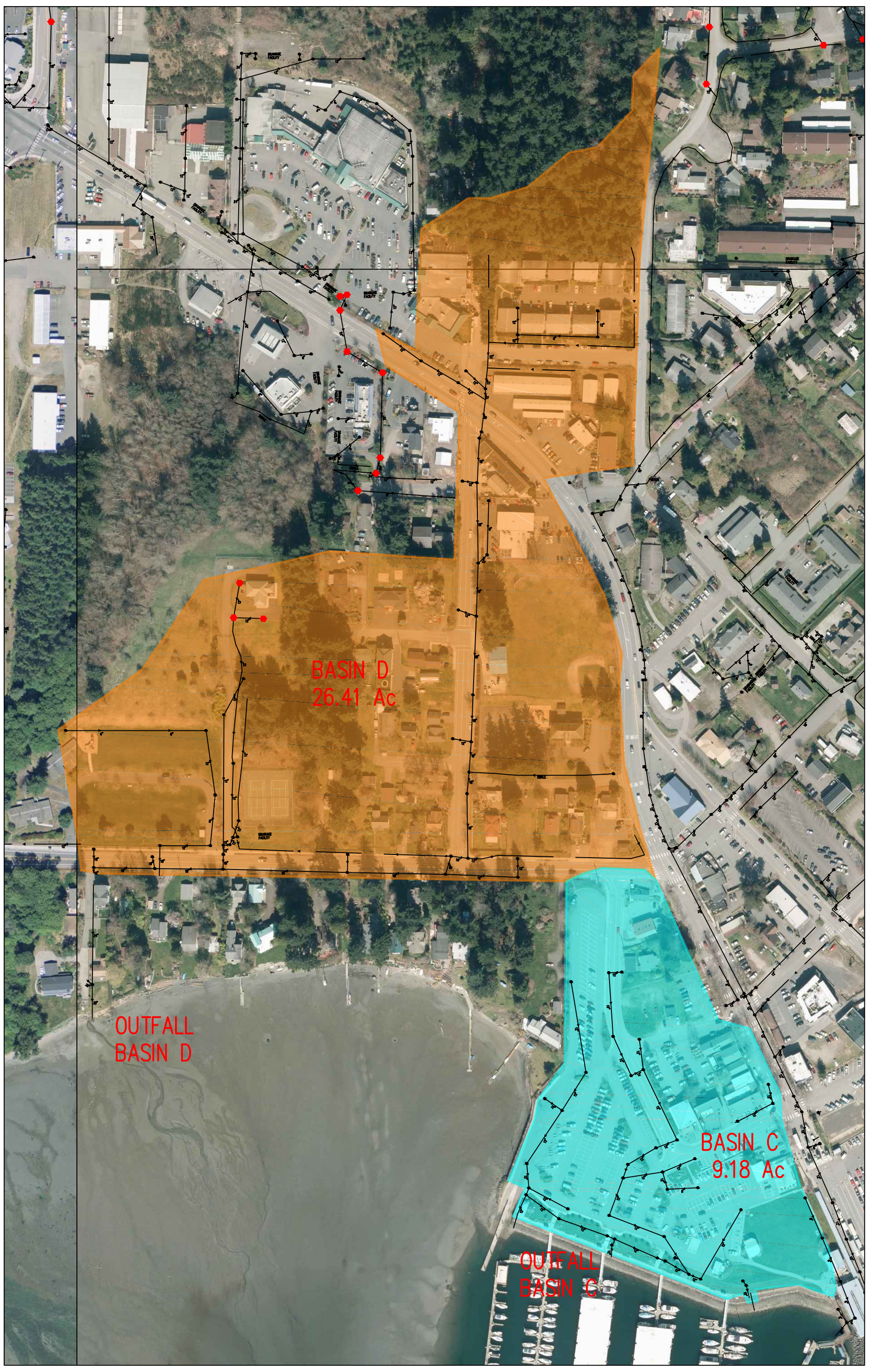
If this were done there exists an opportunity to incorporate a centralized water quality treatment facility that could treat runoff from approximately 23 acres. Two concepts were put forth: a Sand Filter Vault and a Filterra Bioscape™ facility. The former is a standard BMP included in the Department of Ecology's *Stormwater Management Manual for Western Washington* (*Manual*). The latter is a proprietary product that has a General Use Level Designation from Ecology for Enhanced treatment but is not included in the *Manual*. Kitsap has used this product as part of the Manchester Stormwater Park Project. A similar approach could be taken in this concept whereby the Filterra Bioscape™ facility could be incorporated into the open spaces of Mike Wallace Park and be a combined public open space and stormwater facility.

WWHM models were developed for preliminary sizing of these two concepts. For each alternative a WWHM analysis was performed in accordance with the Ecology design guidelines. Both facilities have been sized to provide treatment for the water quality design event, or 91% of all runoff. These concepts, however are scalable. The improvements are a retrofit and not necessarily tied to any development and therefore a smaller design event could be used and still provide a benefit to the local environment.

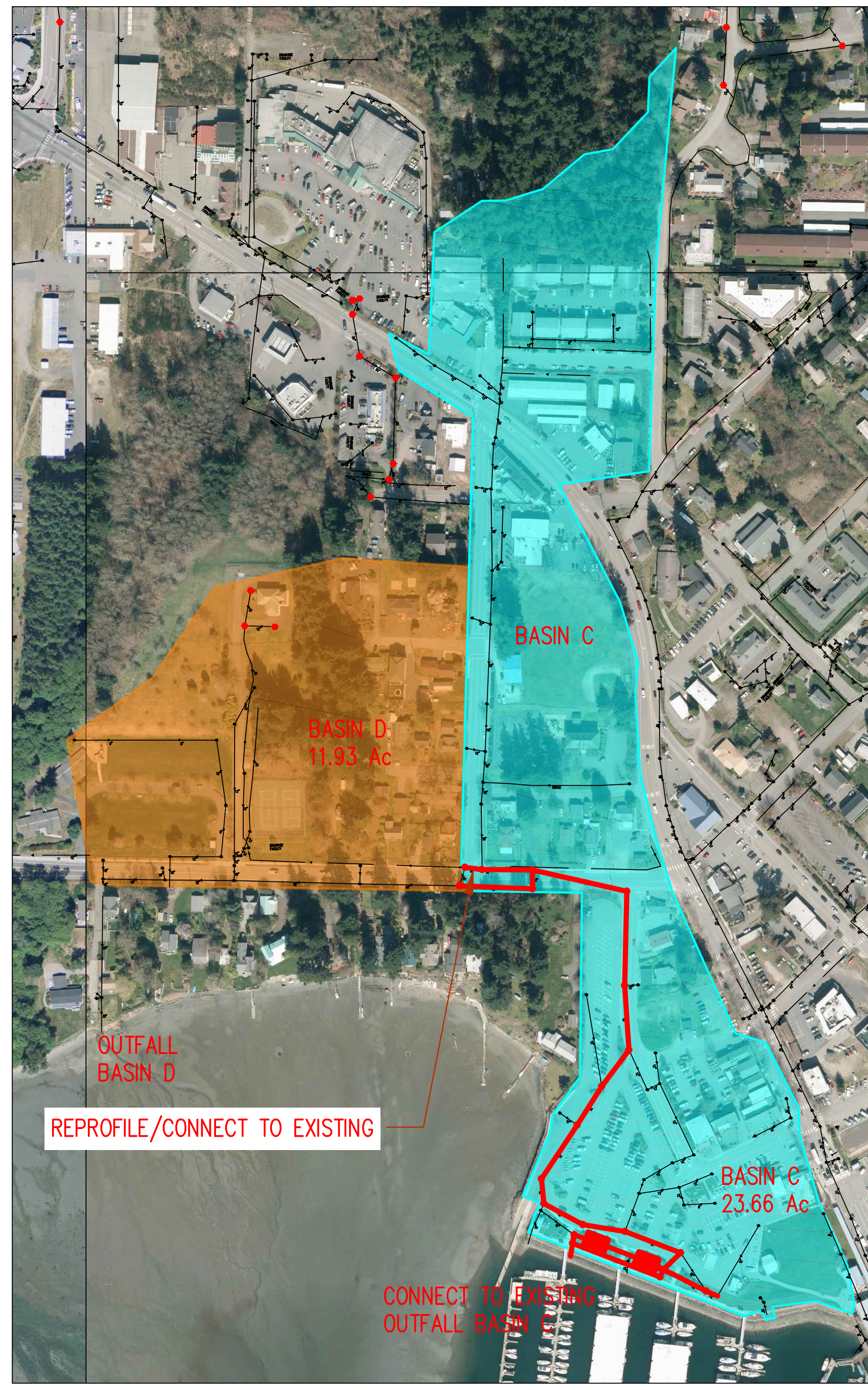
Preliminary layout of the two alternatives is shown in the figures that follow. These concepts were discussed with Kitsap County and Port of Kingston staff. The Sand Filter Vault posed a number of challenges for Port operations both in terms of construction and ongoing maintenance. Impacts to parking, even temporarily, are viewed as extremely negative as it impacts an important revenue source. The location of the vault in front of the boat launch was undesirable as well. In contract, the ability to locate a Filterra Bioscape™ facility in the open spaces while providing dual purpose of landscape and treatment was perceived as positive and the preferred concept.

There are a number of issues that would need to be worked out in the design phase of a project that will determine the ultimate configuration. The Port had suggested another location in Mike Wallace Park nearer the ferry terminal; however it was not large enough to accommodate the full level of treatment. Continued conversation is needed to work out both the technical and practical issues associated with installing a County facility on Port Property.

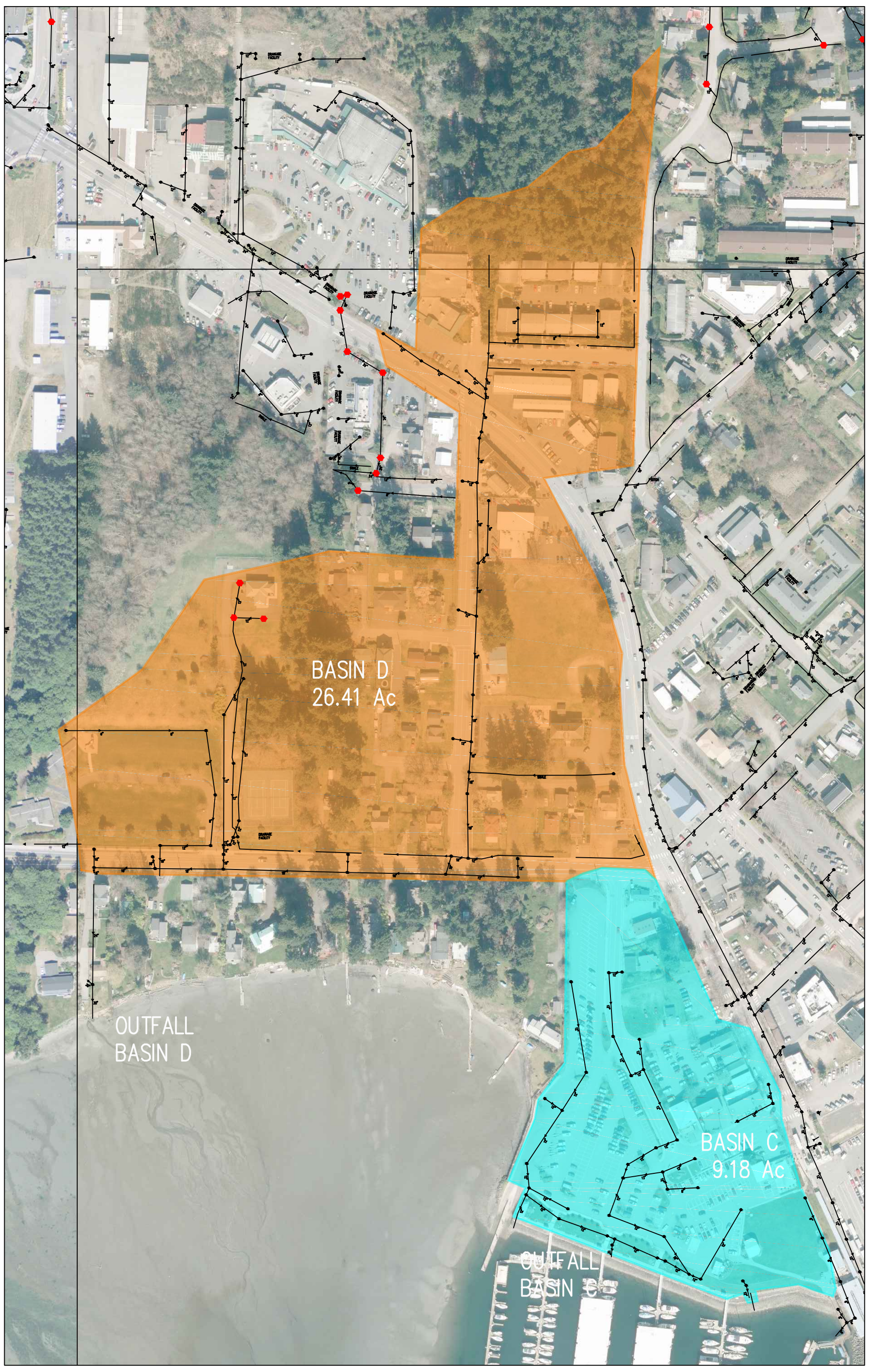
BANNISTER ROAD DIVERSION – FILTERRA OPTION



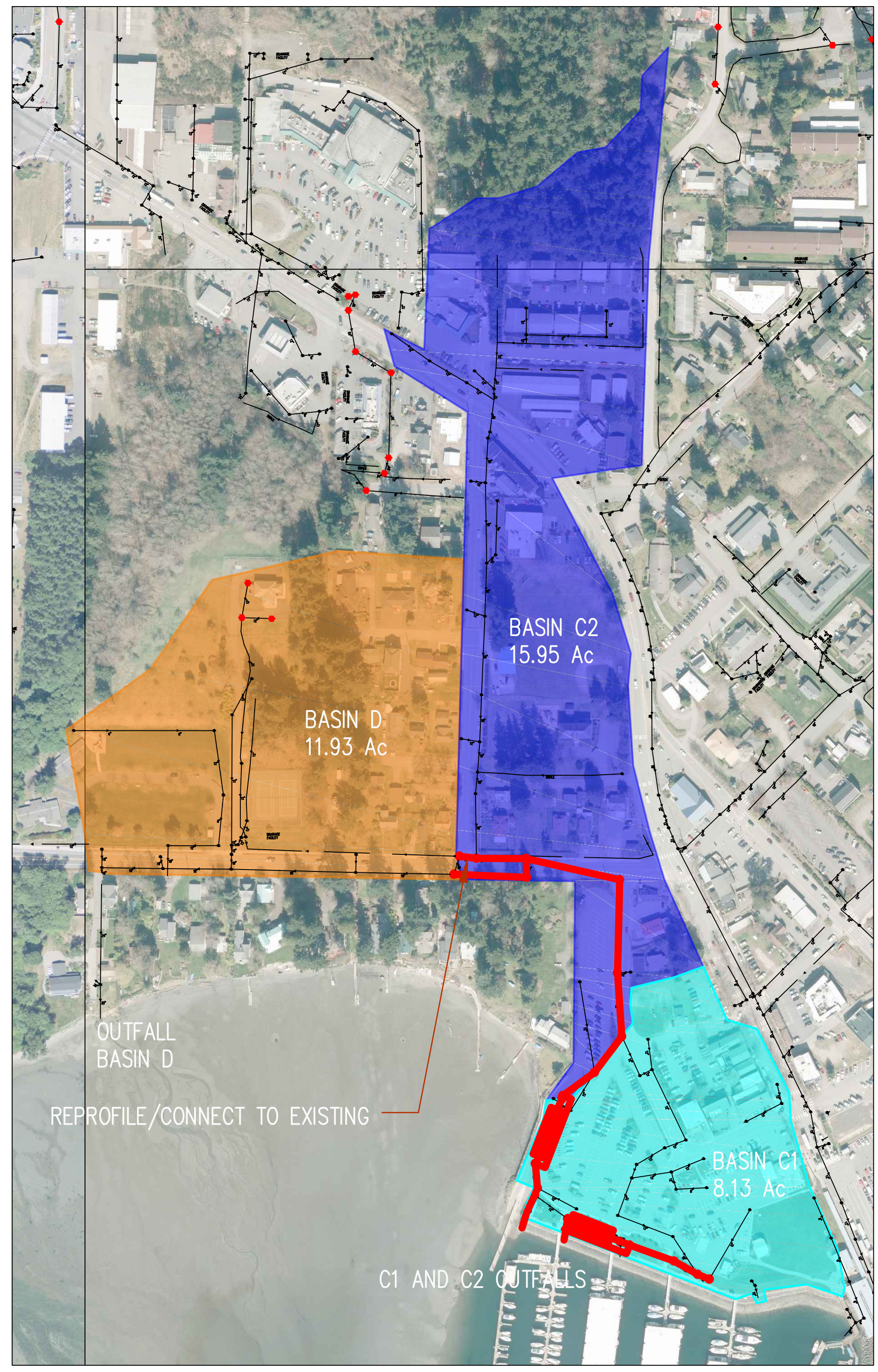
EXISTING BASIN



PROPOSED BASIN



EXISTING BASIN



PROPOSED BASIN

WWHM2012
PROJECT REPORT

Project Name: Filterra Site 2
Site Name:
Site Address:
City :
Report Date: 11/3/2015
Gage : Everett
Data Start : 1979/10/01 00:00
Data End : 2009/09/30 00:00
Precip Scale: 0.80
Version Date: 2015/10/20
Version : 4.2.10

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 2 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	2.5
A B, Lawn, Mod	4.57
C, Lawn, Flat	.13
Pervious Total	7.2

Impervious Land Use	acre
ROADS MOD	8.29
Impervious Total	8.29
Basin Total	15.49

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	2.5
A B, Lawn, Mod	4.57
C, Lawn, Flat	.13

Pervious Total 7.2

Impervious Land Use	acre
ROADS MOD	8.29

Impervious Total 8.29

Basin Total 15.49

Element Flows To:

Surface	Interflow	Groundwater
Sand Filter 1	Sand Filter 1	

Name : Sand Filter 1
Bottom Length: 115.00 ft.
Bottom Width: 20.00 ft.
Depth: 0.75 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Filtration On
Hydraulic conductivity: 70.92
Depth of filter medium: 1.8
Total Volume Infiltrated (ac-ft.): 444.459
Total Volume Through Riser (ac-ft.): 42.435
Total Volume Through Facility (ac-ft.): 486.893
Percent Infiltrated: 91.28
Total Precip Applied to Facility: 3.3
Total Evap From Facility: 0.456
Discharge Structure
Riser Height: 0.7 ft.
Riser Diameter: 100 in.
Orifice 1 Diameter: 12 in. **Elevation:** 0 ft.

Element Flows To:

Outlet 1	Outlet 2
Gravel Trench Bed 1	Gravel Trench Bed 1

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)

0.0000	0.052	0.000	0.000	0.000
0.0083	0.052	0.000	0.356	3.793
0.0167	0.052	0.000	0.504	3.810
0.0250	0.052	0.001	0.617	3.828
0.0333	0.052	0.001	0.713	3.845
0.0417	0.052	0.002	0.797	3.863
0.0500	0.052	0.002	0.873	3.880
0.0583	0.052	0.003	0.943	3.898
0.0667	0.052	0.003	1.009	3.915
0.0750	0.052	0.004	1.070	3.933
0.0833	0.052	0.004	1.128	3.950
0.0917	0.052	0.004	1.183	3.968
0.1000	0.052	0.005	1.235	3.985
0.1083	0.052	0.005	1.286	4.003
0.1167	0.052	0.006	1.334	4.020
0.1250	0.052	0.006	1.381	4.038
0.1333	0.052	0.007	1.426	4.055
0.1417	0.052	0.007	1.470	4.073
0.1500	0.052	0.007	1.513	4.090
0.1583	0.052	0.008	1.554	4.108
0.1667	0.052	0.008	1.595	4.125
0.1750	0.052	0.009	1.634	4.142
0.1833	0.052	0.009	1.673	4.160
0.1917	0.052	0.010	1.710	4.177
0.2000	0.052	0.010	1.747	4.195
0.2083	0.052	0.011	1.783	4.212
0.2167	0.052	0.011	1.818	4.230
0.2250	0.052	0.011	1.853	4.247
0.2333	0.052	0.012	1.887	4.265
0.2417	0.052	0.012	1.921	4.282
0.2500	0.052	0.013	1.953	4.300
0.2583	0.052	0.013	1.986	4.317
0.2667	0.052	0.014	2.017	4.335
0.2750	0.052	0.014	2.049	4.352
0.2833	0.052	0.015	2.080	4.370
0.2917	0.052	0.015	2.110	4.387
0.3000	0.052	0.015	2.140	4.405
0.3083	0.052	0.016	2.169	4.422
0.3167	0.052	0.016	2.199	4.440
0.3250	0.052	0.017	2.227	4.457
0.3333	0.052	0.017	2.256	4.475
0.3417	0.052	0.018	2.284	4.492
0.3500	0.052	0.018	2.311	4.510
0.3583	0.052	0.018	2.339	4.527
0.3667	0.052	0.019	2.366	4.545
0.3750	0.052	0.019	2.393	4.562
0.3833	0.052	0.020	2.419	4.579
0.3917	0.052	0.020	2.445	4.597
0.4000	0.052	0.021	2.471	4.614
0.4083	0.052	0.021	2.497	4.632
0.4167	0.052	0.022	2.522	4.649
0.4250	0.052	0.022	2.547	4.667
0.4333	0.052	0.022	2.572	4.684
0.4417	0.052	0.023	2.597	4.702
0.4500	0.052	0.023	2.621	4.719
0.4583	0.052	0.024	2.645	4.737
0.4667	0.052	0.024	2.669	4.754

0.4750	0.052	0.025	2.693	4.772
0.4833	0.052	0.025	2.716	4.789
0.4917	0.052	0.026	2.740	4.807
0.5000	0.052	0.026	2.763	4.824
0.5083	0.052	0.026	2.786	4.842
0.5167	0.052	0.027	2.808	4.859
0.5250	0.052	0.027	2.831	4.877
0.5333	0.052	0.028	2.853	4.894
0.5417	0.052	0.028	2.876	4.912
0.5500	0.052	0.029	2.898	4.929
0.5583	0.052	0.029	2.919	4.947
0.5667	0.052	0.029	2.941	4.964
0.5750	0.052	0.030	2.963	4.982
0.5833	0.052	0.030	2.984	4.999
0.5917	0.052	0.031	3.005	5.017
0.6000	0.052	0.031	3.026	5.034
0.6083	0.052	0.032	3.047	5.051
0.6167	0.052	0.032	3.068	5.069
0.6250	0.052	0.033	3.089	5.086
0.6333	0.052	0.033	3.109	5.104
0.6417	0.052	0.033	3.130	5.121
0.6500	0.052	0.034	3.150	5.139
0.6583	0.052	0.034	3.170	5.156
0.6667	0.052	0.035	3.190	5.174
0.6750	0.052	0.035	3.210	5.191
0.6833	0.052	0.036	3.230	5.209
0.6917	0.052	0.036	3.249	5.226
0.7000	0.052	0.037	3.269	5.244
0.7083	0.052	0.037	3.356	5.261
0.7167	0.052	0.037	3.498	5.279
0.7250	0.052	0.038	3.677	5.296
0.7333	0.052	0.038	3.884	5.314
0.7417	0.052	0.039	4.117	5.331
0.7500	0.052	0.039	4.373	5.349
0.7583	0.052	0.040	4.649	5.366

Name : Gravel Trench Bed 1
Bottom Length: 100.00 ft.
Bottom Width: 20.00 ft.
Trench bottom slope 1: 0.001 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 0.167
Pour Space of material for first layer: 0.3
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Discharge Structure
Riser Height: 0.167 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 12 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.045	0.000	0.000	0.000
0.0130	0.045	0.000	0.445	0.000
0.0259	0.045	0.000	0.629	0.000
0.0389	0.045	0.000	0.770	0.000
0.0519	0.045	0.000	0.889	0.000
0.0648	0.045	0.000	0.995	0.000
0.0778	0.045	0.001	1.090	0.000
0.0908	0.045	0.001	1.177	0.000
0.1037	0.045	0.001	1.258	0.000
0.1167	0.045	0.001	1.334	0.000
0.1297	0.045	0.001	1.407	0.000
0.1426	0.045	0.002	1.475	0.000
0.1556	0.045	0.002	1.541	0.000
0.1686	0.045	0.002	1.605	0.000
0.1815	0.045	0.003	1.683	0.000
0.1945	0.045	0.003	1.771	0.000
0.2075	0.045	0.004	1.866	0.000
0.2204	0.045	0.005	1.965	0.000
0.2334	0.045	0.005	2.069	0.000
0.2464	0.045	0.006	2.176	0.000
0.2593	0.045	0.006	2.286	0.000
0.2723	0.045	0.007	2.399	0.000
0.2853	0.045	0.008	2.514	0.000
0.2982	0.045	0.008	2.632	0.000
0.3112	0.045	0.009	2.751	0.000
0.3242	0.045	0.009	2.871	0.000
0.3371	0.045	0.010	2.993	0.000
0.3501	0.045	0.011	3.115	0.000
0.3631	0.045	0.011	3.237	0.000
0.3760	0.045	0.012	3.360	0.000
0.3890	0.045	0.012	3.481	0.000
0.4020	0.045	0.013	3.602	0.000
0.4149	0.045	0.014	3.722	0.000
0.4279	0.045	0.014	3.839	0.000
0.4409	0.045	0.015	3.955	0.000
0.4538	0.045	0.015	4.068	0.000
0.4668	0.045	0.016	4.178	0.000
0.4798	0.045	0.017	4.285	0.000
0.4927	0.045	0.017	4.388	0.000
0.5057	0.045	0.018	4.488	0.000
0.5187	0.045	0.018	4.583	0.000
0.5316	0.045	0.019	4.675	0.000
0.5446	0.045	0.020	4.762	0.000
0.5576	0.045	0.020	4.845	0.000
0.5705	0.045	0.021	4.923	0.000
0.5835	0.045	0.021	4.997	0.000
0.5965	0.045	0.022	5.067	0.000
0.6094	0.045	0.023	5.133	0.000
0.6224	0.045	0.023	5.196	0.000
0.6354	0.045	0.024	5.256	0.000
0.6483	0.045	0.024	5.314	0.000

0.6613	0.045	0.025	5.370	0.000
0.6743	0.045	0.026	5.452	0.000
0.6872	0.045	0.026	5.511	0.000
0.7002	0.045	0.027	5.569	0.000
0.7132	0.045	0.027	5.627	0.000
0.7261	0.045	0.028	5.685	0.000
0.7391	0.045	0.028	5.741	0.000
0.7521	0.045	0.029	5.798	0.000
0.7650	0.045	0.030	5.853	0.000
0.7780	0.045	0.030	5.908	0.000
0.7910	0.045	0.031	5.963	0.000
0.8039	0.045	0.031	6.017	0.000
0.8169	0.045	0.032	6.071	0.000
0.8299	0.045	0.033	6.124	0.000
0.8428	0.045	0.033	6.176	0.000
0.8558	0.045	0.034	6.229	0.000
0.8688	0.045	0.034	6.280	0.000
0.8817	0.045	0.035	6.332	0.000
0.8947	0.045	0.036	6.383	0.000
0.9077	0.045	0.036	6.433	0.000
0.9206	0.045	0.037	6.483	0.000
0.9336	0.045	0.037	6.533	0.000
0.9466	0.045	0.038	6.582	0.000
0.9595	0.045	0.039	6.631	0.000
0.9725	0.045	0.039	6.680	0.000
0.9855	0.045	0.040	6.728	0.000
0.9984	0.045	0.040	6.776	0.000
1.0114	0.045	0.041	6.824	0.000
1.0244	0.045	0.042	6.871	0.000
1.0373	0.045	0.042	6.918	0.000
1.0503	0.045	0.043	6.964	0.000
1.0633	0.045	0.043	7.011	0.000
1.0762	0.045	0.044	7.057	0.000
1.0892	0.045	0.045	7.102	0.000
1.1022	0.045	0.045	7.148	0.000
1.1151	0.045	0.046	7.193	0.000
1.1281	0.045	0.046	7.238	0.000
1.1411	0.045	0.047	7.282	0.000
1.1540	0.045	0.048	7.327	0.000
1.1670	0.045	0.048	7.371	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:7.2
Total Impervious Area:8.29

Mitigated Landuse Totals for POC #1
Total Pervious Area:7.2

Total Impervious Area:8.29

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	3.091614
5 year	3.986309
10 year	4.578448
25 year	5.330058
50 year	5.894067
100 year	6.462599

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	2.95097
5 year	3.779262
10 year	4.336325
25 year	5.052934
50 year	5.597274
100 year	6.151429

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1980	4.263	4.199
1981	2.796	2.734
1982	3.989	3.914
1983	3.291	3.110
1984	2.092	2.030
1985	2.682	2.814
1986	2.407	2.396
1987	3.771	4.085
1988	2.314	2.231
1989	3.689	2.901
1990	3.538	3.424
1991	4.053	3.571
1992	2.079	2.000
1993	2.329	1.992
1994	2.276	2.200
1995	2.537	2.435
1996	3.166	3.020
1997	2.579	2.530
1998	2.712	2.649
1999	5.763	5.465
2000	2.691	2.607
2001	3.286	3.050
2002	3.354	3.495
2003	3.326	2.905
2004	5.546	5.253
2005	2.193	2.345
2006	2.061	2.109
2007	5.221	4.601
2008	3.778	3.527
2009	4.013	3.863

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	5.7632	5.4654
2	5.5459	5.2532
3	5.2205	4.6010
4	4.2634	4.1988
5	4.0535	4.0854
6	4.0125	3.9142
7	3.9889	3.8627
8	3.7783	3.5712
9	3.7709	3.5274
10	3.6885	3.4953
11	3.5383	3.4241
12	3.3545	3.1099
13	3.3256	3.0501
14	3.2908	3.0197
15	3.2864	2.9045
16	3.1657	2.9006
17	2.7955	2.8142
18	2.7122	2.7342
19	2.6907	2.6494
20	2.6817	2.6068
21	2.5786	2.5303
22	2.5368	2.4349
23	2.4066	2.3959
24	2.3285	2.3452
25	2.3143	2.2311
26	2.2762	2.2004
27	2.1934	2.1093
28	2.0920	2.0298
29	2.0793	1.9996
30	2.0609	1.9915

Stream Protection Duration
POC #1
The Facility PASSED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
1.5458	675	685	101	Fail
1.5614	652	657	100	Pass
1.5770	628	629	100	Pass
1.5926	606	600	99	Pass
1.6083	588	586	99	Pass
1.6239	575	573	99	Pass
1.6395	555	565	101	Fail
1.6551	538	558	103	Fail
1.6707	527	537	101	Fail
1.6863	513	517	100	Pass
1.7019	498	504	101	Fail
1.7176	479	490	102	Fail
1.7332	462	474	102	Fail
1.7488	448	459	102	Fail
1.7644	429	441	102	Fail

1.7800	411	424	103	Fail
1.7956	402	414	102	Fail
1.8112	392	406	103	Fail
1.8269	382	395	103	Fail
1.8425	365	385	105	Fail
1.8581	348	373	107	Fail
1.8737	340	359	105	Fail
1.8893	333	349	104	Fail
1.9049	328	342	104	Fail
1.9205	321	337	104	Fail
1.9362	315	328	104	Fail
1.9518	308	319	103	Fail
1.9674	299	307	102	Fail
1.9830	293	300	102	Fail
1.9986	290	292	100	Pass
2.0142	281	278	98	Pass
2.0298	277	267	96	Pass
2.0455	267	261	97	Pass
2.0611	256	253	98	Pass
2.0767	248	242	97	Pass
2.0923	235	236	100	Pass
2.1079	231	229	99	Pass
2.1235	226	221	97	Pass
2.1391	219	219	100	Pass
2.1548	209	214	102	Fail
2.1704	201	210	104	Fail
2.1860	200	205	102	Fail
2.2016	197	195	98	Pass
2.2172	191	190	99	Pass
2.2328	185	183	98	Pass
2.2484	182	178	97	Pass
2.2641	178	173	97	Pass
2.2797	176	168	95	Pass
2.2953	172	162	94	Pass
2.3109	163	155	95	Pass
2.3265	155	152	98	Pass
2.3421	152	147	96	Pass
2.3577	147	143	97	Pass
2.3734	146	140	95	Pass
2.3890	142	135	95	Pass
2.4046	141	130	92	Pass
2.4202	140	127	90	Pass
2.4358	138	125	90	Pass
2.4514	136	125	91	Pass
2.4670	130	119	91	Pass
2.4827	127	117	92	Pass
2.4983	126	116	92	Pass
2.5139	125	115	92	Pass
2.5295	123	112	91	Pass
2.5451	121	109	90	Pass
2.5607	116	107	92	Pass
2.5763	110	105	95	Pass
2.5920	108	102	94	Pass
2.6076	107	100	93	Pass
2.6232	104	98	94	Pass
2.6388	100	96	96	Pass
2.6544	97	93	95	Pass

2.6700	94	90	95	Pass
2.6856	89	88	98	Pass
2.7013	88	86	97	Pass
2.7169	87	86	98	Pass
2.7325	87	85	97	Pass
2.7481	84	83	98	Pass
2.7637	83	81	97	Pass
2.7793	81	79	97	Pass
2.7949	80	78	97	Pass
2.8106	76	74	97	Pass
2.8262	75	70	93	Pass
2.8418	73	70	95	Pass
2.8574	73	69	94	Pass
2.8730	72	69	95	Pass
2.8886	70	68	97	Pass
2.9042	68	65	95	Pass
2.9199	67	63	94	Pass
2.9355	66	59	89	Pass
2.9511	63	58	92	Pass
2.9667	63	58	92	Pass
2.9823	63	56	88	Pass
2.9979	62	54	87	Pass
3.0135	60	53	88	Pass
3.0292	60	51	85	Pass
3.0448	60	51	85	Pass
3.0604	59	49	83	Pass
3.0760	59	48	81	Pass
3.0916	57	47	82	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique Used for Total Volumn Volumn Infiltration Cumulative
Percent Water Quality Percent Comment
Treatment? Needs Through Volumn Volumn
Volumn Water Quality
Treatment Facility (ac-ft.) Infiltration
Infiltrated Treated
(ac-ft) (ac-ft) Credit

Gravel Trench Bed 1 POC N 443.11 N 0.00
Sand Filter 1 N 444.43 N
0.00
Total Volume Infiltrated 887.54 0.00 0.00 0.00
0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: SF - Basin C1
Site Name: Kingston
Site Address:
City :
Report Date: 3/6/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2015/10/20
Version : 4.2.10

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 2 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Mod	.16
C, Lawn, Mod	1.06

Pervious Total 1.22

Impervious Land Use	acre
ROADS MOD	6.99

Impervious Total 6.99

Basin Total 8.21

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Lawn, Mod	**1.06**
A B, Lawn, Mod	**.16**

Pervious Total **1.22**

Impervious Land Use	**acre**
ROADS MOD	**6.99**

Impervious Total **6.99**

Basin Total **8.21**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 1	Sand Filter 1	

Name : Sand Filter 1
Bottom Length: 95.00 ft.
Bottom Width: 30.00 ft.
Depth: 6 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Filtration On
Hydraulic conductivity: 0.7
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 845.977
Total Volume Through Riser (ac-ft.): 68.468
Total Volume Through Facility (ac-ft.): 914.445
Percent Infiltrated: 92.51
Total Precip Applied to Facility: 9.511
Total Evap From Facility: 2.209
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 18 in.

Element Flows To:
Outlet 1 **Outlet 2**

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.065	0.000	0.000	0.000
0.0667	0.065	0.004	0.000	0.048
0.1333	0.065	0.008	0.000	0.050

0.2000	0.065	0.013	0.000	0.052
0.2667	0.065	0.017	0.000	0.054
0.3333	0.065	0.021	0.000	0.056
0.4000	0.065	0.026	0.000	0.058
0.4667	0.065	0.030	0.000	0.060
0.5333	0.065	0.034	0.000	0.062
0.6000	0.065	0.039	0.000	0.064
0.6667	0.065	0.043	0.000	0.066
0.7333	0.065	0.048	0.000	0.068
0.8000	0.065	0.052	0.000	0.070
0.8667	0.065	0.056	0.000	0.072
0.9333	0.065	0.061	0.000	0.074
1.0000	0.065	0.065	0.000	0.077
1.0667	0.065	0.069	0.000	0.079
1.1333	0.065	0.074	0.000	0.081
1.2000	0.065	0.078	0.000	0.083
1.2667	0.065	0.082	0.000	0.085
1.3333	0.065	0.087	0.000	0.087
1.4000	0.065	0.091	0.000	0.089
1.4667	0.065	0.096	0.000	0.091
1.5333	0.065	0.100	0.000	0.093
1.6000	0.065	0.104	0.000	0.095
1.6667	0.065	0.109	0.000	0.097
1.7333	0.065	0.113	0.000	0.099
1.8000	0.065	0.117	0.000	0.101
1.8667	0.065	0.122	0.000	0.103
1.9333	0.065	0.126	0.000	0.105
2.0000	0.065	0.130	0.000	0.107
2.0667	0.065	0.135	0.000	0.109
2.1333	0.065	0.139	0.000	0.111
2.2000	0.065	0.143	0.000	0.113
2.2667	0.065	0.148	0.000	0.116
2.3333	0.065	0.152	0.000	0.118
2.4000	0.065	0.157	0.000	0.120
2.4667	0.065	0.161	0.000	0.122
2.5333	0.065	0.165	0.000	0.124
2.6000	0.065	0.170	0.000	0.126
2.6667	0.065	0.174	0.000	0.128
2.7333	0.065	0.178	0.000	0.130
2.8000	0.065	0.183	0.000	0.132
2.8667	0.065	0.187	0.000	0.134
2.9333	0.065	0.191	0.000	0.136
3.0000	0.065	0.196	0.000	0.138
3.0667	0.065	0.200	0.000	0.140
3.1333	0.065	0.205	0.000	0.142
3.2000	0.065	0.209	0.000	0.144
3.2667	0.065	0.213	0.000	0.146
3.3333	0.065	0.218	0.000	0.148
3.4000	0.065	0.222	0.000	0.150
3.4667	0.065	0.226	0.000	0.152
3.5333	0.065	0.231	0.000	0.155
3.6000	0.065	0.235	0.000	0.157
3.6667	0.065	0.239	0.000	0.159
3.7333	0.065	0.244	0.000	0.161
3.8000	0.065	0.248	0.000	0.163
3.8667	0.065	0.253	0.000	0.165
3.9333	0.065	0.257	0.000	0.167

4.0000	0.065	0.261	0.000	0.169
4.0667	0.065	0.266	0.000	0.171
4.1333	0.065	0.270	0.000	0.173
4.2000	0.065	0.274	0.000	0.175
4.2667	0.065	0.279	0.000	0.177
4.3333	0.065	0.283	0.000	0.179
4.4000	0.065	0.287	0.000	0.181
4.4667	0.065	0.292	0.000	0.183
4.5333	0.065	0.296	0.000	0.185
4.6000	0.065	0.301	0.000	0.187
4.6667	0.065	0.305	0.000	0.189
4.7333	0.065	0.309	0.000	0.191
4.8000	0.065	0.314	0.000	0.194
4.8667	0.065	0.318	0.000	0.196
4.9333	0.065	0.322	0.000	0.198
5.0000	0.065	0.327	0.000	0.200
5.0667	0.065	0.331	0.273	0.202
5.1333	0.065	0.335	0.771	0.204
5.2000	0.065	0.340	1.404	0.206
5.2667	0.065	0.344	2.123	0.208
5.3333	0.065	0.348	2.882	0.210
5.4000	0.065	0.353	3.632	0.212
5.4667	0.065	0.357	4.326	0.214
5.5333	0.065	0.362	4.924	0.216
5.6000	0.065	0.366	5.401	0.218
5.6667	0.065	0.370	5.754	0.220
5.7333	0.065	0.375	6.014	0.222
5.8000	0.065	0.379	6.338	0.224
5.8667	0.065	0.383	6.597	0.226
5.9333	0.065	0.388	6.846	0.228
6.0000	0.065	0.392	7.086	0.230
6.0667	0.065	0.396	7.319	0.233

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.22
Total Impervious Area:6.99

Mitigated Landuse Totals for POC #1
Total Pervious Area:1.22
Total Impervious Area:6.99

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	2.432105
5 year	3.07995
10 year	3.520989

25 year	4.093972
50 year	4.533117
100 year	4.983408

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	1.686468
5 year	2.357921
10 year	2.69744
25 year	3.02953
50 year	3.221469
100 year	3.376602

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	3.185	1.410
1950	3.236	2.187
1951	1.901	1.602
1952	1.573	1.205
1953	1.885	1.094
1954	1.955	1.015
1955	2.348	1.505
1956	2.087	1.317
1957	2.357	2.135
1958	2.006	1.093
1959	2.177	1.127
1960	2.136	1.680
1961	2.045	1.823
1962	1.775	0.637
1963	2.133	1.117
1964	2.097	1.258
1965	2.418	0.967
1966	1.732	1.081
1967	2.857	2.605
1968	3.712	1.616
1969	2.216	2.127
1970	2.258	1.899
1971	2.733	1.844
1972	2.742	2.292
1973	1.750	1.007
1974	2.571	1.197
1975	2.703	2.122
1976	2.036	1.581
1977	2.021	1.019
1978	2.893	2.070
1979	3.582	0.639
1980	3.725	3.282
1981	2.386	2.151
1982	3.412	3.015
1983	2.785	1.983
1984	1.784	0.986
1985	2.277	2.085
1986	2.040	1.652
1987	3.181	1.949
1988	1.951	1.072

1989	3.110	0.777
1990	2.985	2.371
1991	3.541	2.948
1992	1.787	1.390
1993	1.963	0.932
1994	1.918	0.203
1995	2.161	1.278
1996	2.733	2.071
1997	2.215	2.008
1998	2.300	1.603
1999	4.913	2.204
2000	2.305	1.479
2001	2.772	1.910
2002	2.884	2.790
2003	2.888	1.022
2004	4.747	4.195
2005	1.891	1.725
2006	1.781	1.505
2007	4.480	3.447
2008	3.303	2.880
2009	3.383	1.973

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	4.9131	4.1951
2	4.7471	3.4474
3	4.4799	3.2818
4	3.7254	3.0151
5	3.7120	2.9485
6	3.5816	2.8801
7	3.5406	2.7900
8	3.4123	2.6046
9	3.3834	2.3715
10	3.3032	2.2921
11	3.2364	2.2037
12	3.1853	2.1873
13	3.1812	2.1514
14	3.1102	2.1350
15	2.9850	2.1270
16	2.8927	2.1218
17	2.8875	2.0851
18	2.8838	2.0710
19	2.8571	2.0698
20	2.7849	2.0075
21	2.7720	1.9835
22	2.7423	1.9735
23	2.7334	1.9489
24	2.7327	1.9098
25	2.7030	1.8990
26	2.5710	1.8442
27	2.4184	1.8232
28	2.3860	1.7254
29	2.3567	1.6805
30	2.3482	1.6521
31	2.3048	1.6161

32	2.3002	1.6027
33	2.2767	1.6024
34	2.2582	1.5813
35	2.2155	1.5049
36	2.2151	1.5046
37	2.1770	1.4790
38	2.1605	1.4095
39	2.1361	1.3901
40	2.1334	1.3169
41	2.0966	1.2779
42	2.0868	1.2578
43	2.0447	1.2054
44	2.0404	1.1970
45	2.0363	1.1273
46	2.0206	1.1166
47	2.0061	1.0941
48	1.9634	1.0932
49	1.9551	1.0807
50	1.9507	1.0721
51	1.9184	1.0218
52	1.9007	1.0189
53	1.8907	1.0151
54	1.8847	1.0074
55	1.7871	0.9855
56	1.7841	0.9665
57	1.7811	0.9323
58	1.7749	0.7770
59	1.7505	0.6391
60	1.7319	0.6372
61	1.5735	0.2033

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
1.2161	1467	392	26	Pass
1.2283	1419	381	26	Pass
1.2406	1372	373	27	Pass
1.2529	1336	364	27	Pass
1.2652	1282	357	27	Pass
1.2775	1249	349	27	Pass
1.2898	1211	340	28	Pass
1.3020	1166	327	28	Pass
1.3143	1132	318	28	Pass
1.3266	1091	311	28	Pass
1.3389	1059	305	28	Pass
1.3512	1021	294	28	Pass
1.3635	991	289	29	Pass
1.3757	959	280	29	Pass
1.3880	928	275	29	Pass
1.4003	904	270	29	Pass
1.4126	876	263	30	Pass
1.4249	850	260	30	Pass

1.4372	822	252	30	Pass
1.4494	799	240	30	Pass
1.4617	775	231	29	Pass
1.4740	749	229	30	Pass
1.4863	720	221	30	Pass
1.4986	683	217	31	Pass
1.5109	652	211	32	Pass
1.5231	625	208	33	Pass
1.5354	612	199	32	Pass
1.5477	587	196	33	Pass
1.5600	570	193	33	Pass
1.5723	539	187	34	Pass
1.5846	522	185	35	Pass
1.5968	514	177	34	Pass
1.6091	505	166	32	Pass
1.6214	493	162	32	Pass
1.6337	483	156	32	Pass
1.6460	476	153	32	Pass
1.6583	465	151	32	Pass
1.6705	453	150	33	Pass
1.6828	438	147	33	Pass
1.6951	431	146	33	Pass
1.7074	422	144	34	Pass
1.7197	412	140	33	Pass
1.7320	407	135	33	Pass
1.7442	396	131	33	Pass
1.7565	383	129	33	Pass
1.7688	367	123	33	Pass
1.7811	352	122	34	Pass
1.7934	339	121	35	Pass
1.8057	330	116	35	Pass
1.8179	316	116	36	Pass
1.8302	313	114	36	Pass
1.8425	303	113	37	Pass
1.8548	296	111	37	Pass
1.8671	289	107	37	Pass
1.8794	282	104	36	Pass
1.8916	274	102	37	Pass
1.9039	266	101	37	Pass
1.9162	258	98	37	Pass
1.9285	254	95	37	Pass
1.9408	252	91	36	Pass
1.9531	243	90	37	Pass
1.9653	235	89	37	Pass
1.9776	231	87	37	Pass
1.9899	226	86	38	Pass
2.0022	218	85	38	Pass
2.0145	215	82	38	Pass
2.0268	209	79	37	Pass
2.0390	203	78	38	Pass
2.0513	198	77	38	Pass
2.0636	197	77	39	Pass
2.0759	193	73	37	Pass
2.0882	190	67	35	Pass
2.1005	183	67	36	Pass
2.1127	181	66	36	Pass
2.1250	177	62	35	Pass

2.1373	168	60	35	Pass
2.1496	168	60	35	Pass
2.1619	165	58	35	Pass
2.1742	161	58	36	Pass
2.1864	157	57	36	Pass
2.1987	152	54	35	Pass
2.2110	148	53	35	Pass
2.2233	144	52	36	Pass
2.2356	140	51	36	Pass
2.2479	138	51	36	Pass
2.2601	135	51	37	Pass
2.2724	133	51	38	Pass
2.2847	128	50	39	Pass
2.2970	123	47	38	Pass
2.3093	120	46	38	Pass
2.3216	119	45	37	Pass
2.3338	118	45	38	Pass
2.3461	116	44	37	Pass
2.3584	112	43	38	Pass
2.3707	110	39	35	Pass
2.3830	108	37	34	Pass
2.3953	104	35	33	Pass
2.4075	100	35	35	Pass
2.4198	96	34	35	Pass
2.4321	95	34	35	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volumn Needs Treatment (ac-ft)	Volumn Through Facility (ac-ft)	Infiltration Volumn (ac-ft.)	Cumulative Volumn Infiltration Credit	Percent Volumn Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Sand Filter 1 POC	N	832.09			N	0.00			
Total Volume Infiltrated		832.09	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: SF- Site 2
Site Name: Kingston
Site Address:
City :
Report Date: 3/6/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2015/10/20
Version : 4.2.10

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 2 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	2.71
A B, Lawn, Mod	4.94
Pervious Total	7.65

Impervious Land Use	acre
ROADS MOD	8.3
Impervious Total	8.3
Basin Total	15.95

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Mod	4.94
A B, Forest, Mod	2.71

Pervious Total 7.65

Impervious Land Use	acre
ROADS MOD	8.3

Impervious Total 8.3

Basin Total 15.95

Element Flows To:

Surface	Interflow	Groundwater
Sand Filter 1	Sand Filter 1	

Name : Sand Filter 1
Bottom Length: 165.00 ft.
Bottom Width: 20.00 ft.
Depth: 6 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Filtration On
Hydraulic conductivity: 0.7
Depth of filter medium: 1.5
Total Volume Infiltrated (ac-ft.): 946.47
Total Volume Through Riser (ac-ft.): 77.59
Total Volume Through Facility (ac-ft.): 1024.06
Percent Infiltrated: 92.42
Total Precip Applied to Facility: 10.046
Total Evap From Facility: 1.762
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 18 in.

Element Flows To:
Outlet 1 **Outlet 2**

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.075	0.000	0.000	0.000
0.0667	0.075	0.005	0.000	0.055
0.1333	0.075	0.010	0.000	0.058

0.2000	0.075	0.015	0.000	0.060
0.2667	0.075	0.020	0.000	0.063
0.3333	0.075	0.025	0.000	0.065
0.4000	0.075	0.030	0.000	0.067
0.4667	0.075	0.035	0.000	0.070
0.5333	0.075	0.040	0.000	0.072
0.6000	0.075	0.045	0.000	0.074
0.6667	0.075	0.050	0.000	0.077
0.7333	0.075	0.055	0.000	0.079
0.8000	0.075	0.060	0.000	0.082
0.8667	0.075	0.065	0.000	0.084
0.9333	0.075	0.070	0.000	0.086
1.0000	0.075	0.075	0.000	0.089
1.0667	0.075	0.080	0.000	0.091
1.1333	0.075	0.085	0.000	0.093
1.2000	0.075	0.090	0.000	0.096
1.2667	0.075	0.096	0.000	0.098
1.3333	0.075	0.101	0.000	0.101
1.4000	0.075	0.106	0.000	0.103
1.4667	0.075	0.111	0.000	0.105
1.5333	0.075	0.116	0.000	0.108
1.6000	0.075	0.121	0.000	0.110
1.6667	0.075	0.126	0.000	0.112
1.7333	0.075	0.131	0.000	0.115
1.8000	0.075	0.136	0.000	0.117
1.8667	0.075	0.141	0.000	0.120
1.9333	0.075	0.146	0.000	0.122
2.0000	0.075	0.151	0.000	0.124
2.0667	0.075	0.156	0.000	0.127
2.1333	0.075	0.161	0.000	0.129
2.2000	0.075	0.166	0.000	0.131
2.2667	0.075	0.171	0.000	0.134
2.3333	0.075	0.176	0.000	0.136
2.4000	0.075	0.181	0.000	0.139
2.4667	0.075	0.186	0.000	0.141
2.5333	0.075	0.191	0.000	0.143
2.6000	0.075	0.197	0.000	0.146
2.6667	0.075	0.202	0.000	0.148
2.7333	0.075	0.207	0.000	0.150
2.8000	0.075	0.212	0.000	0.153
2.8667	0.075	0.217	0.000	0.155
2.9333	0.075	0.222	0.000	0.158
3.0000	0.075	0.227	0.000	0.160
3.0667	0.075	0.232	0.000	0.162
3.1333	0.075	0.237	0.000	0.165
3.2000	0.075	0.242	0.000	0.167
3.2667	0.075	0.247	0.000	0.169
3.3333	0.075	0.252	0.000	0.172
3.4000	0.075	0.257	0.000	0.174
3.4667	0.075	0.262	0.000	0.177
3.5333	0.075	0.267	0.000	0.179
3.6000	0.075	0.272	0.000	0.181
3.6667	0.075	0.277	0.000	0.184
3.7333	0.075	0.282	0.000	0.186
3.8000	0.075	0.287	0.000	0.188
3.8667	0.075	0.292	0.000	0.191
3.9333	0.075	0.298	0.000	0.193

4.0000	0.075	0.303	0.000	0.196
4.0667	0.075	0.308	0.000	0.198
4.1333	0.075	0.313	0.000	0.200
4.2000	0.075	0.318	0.000	0.203
4.2667	0.075	0.323	0.000	0.205
4.3333	0.075	0.328	0.000	0.207
4.4000	0.075	0.333	0.000	0.210
4.4667	0.075	0.338	0.000	0.212
4.5333	0.075	0.343	0.000	0.215
4.6000	0.075	0.348	0.000	0.217
4.6667	0.075	0.353	0.000	0.219
4.7333	0.075	0.358	0.000	0.222
4.8000	0.075	0.363	0.000	0.224
4.8667	0.075	0.368	0.000	0.227
4.9333	0.075	0.373	0.000	0.229
5.0000	0.075	0.378	0.000	0.231
5.0667	0.075	0.383	0.273	0.234
5.1333	0.075	0.388	0.771	0.236
5.2000	0.075	0.393	1.404	0.238
5.2667	0.075	0.399	2.123	0.241
5.3333	0.075	0.404	2.882	0.243
5.4000	0.075	0.409	3.632	0.246
5.4667	0.075	0.414	4.326	0.248
5.5333	0.075	0.419	4.924	0.250
5.6000	0.075	0.424	5.401	0.253
5.6667	0.075	0.429	5.754	0.255
5.7333	0.075	0.434	6.014	0.257
5.8000	0.075	0.439	6.338	0.260
5.8667	0.075	0.444	6.597	0.262
5.9333	0.075	0.449	6.846	0.265
6.0000	0.075	0.454	7.086	0.267
6.0667	0.075	0.459	7.319	0.269

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:7.65
Total Impervious Area:8.3

Mitigated Landuse Totals for POC #1
Total Pervious Area:7.65
Total Impervious Area:8.3

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	2.839385
5 year	3.597752
10 year	4.124868

25 year	4.820941
50 year	5.362173
100 year	5.923533

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	1.882076
5 year	2.671737
10 year	3.144417
25 year	3.68662
50 year	4.054059
100 year	4.393572

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	3.666	1.585
1950	3.840	2.611
1951	2.231	1.860
1952	1.864	1.396
1953	2.236	1.286
1954	2.287	1.179
1955	2.761	1.751
1956	2.481	1.529
1957	2.744	2.474
1958	2.360	1.266
1959	2.588	1.311
1960	2.457	1.944
1961	2.386	2.150
1962	2.095	0.829
1963	2.487	1.274
1964	2.489	1.385
1965	2.800	1.117
1966	2.026	1.296
1967	3.356	3.034
1968	4.365	1.896
1969	2.575	2.450
1970	2.640	2.196
1971	3.200	2.097
1972	3.191	2.619
1973	2.079	1.177
1974	2.999	1.406
1975	3.209	2.432
1976	2.369	1.811
1977	2.399	1.257
1978	3.435	2.434
1979	4.252	0.741
1980	4.255	3.730
1981	2.796	2.507
1982	3.988	3.450
1983	3.294	2.466
1984	2.092	1.125
1985	2.683	2.570
1986	2.408	1.880
1987	3.775	2.277
1988	2.317	1.249

1989	3.693	0.907
1990	3.542	2.674
1991	4.045	3.324
1992	2.078	1.613
1993	2.331	1.087
1994	2.279	0.378
1995	2.537	1.477
1996	3.163	2.458
1997	2.577	1.894
1998	2.714	1.870
1999	5.765	2.420
2000	2.690	1.733
2001	3.290	2.405
2002	3.352	3.221
2003	3.321	1.013
2004	5.545	4.900
2005	2.191	1.974
2006	2.058	1.703
2007	5.219	3.848
2008	3.769	3.229
2009	4.017	2.250

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	5.7649	4.9003
2	5.5452	3.8481
3	5.2185	3.7299
4	4.3650	3.4501
5	4.2547	3.3242
6	4.2516	3.2290
7	4.0446	3.2213
8	4.0174	3.0344
9	3.9884	2.6736
10	3.8401	2.6191
11	3.7753	2.6110
12	3.7692	2.5697
13	3.6930	2.5075
14	3.6663	2.4742
15	3.5424	2.4665
16	3.4346	2.4580
17	3.3561	2.4504
18	3.3521	2.4335
19	3.3210	2.4325
20	3.2936	2.4204
21	3.2902	2.4048
22	3.2094	2.2765
23	3.2001	2.2497
24	3.1911	2.1958
25	3.1628	2.1504
26	2.9992	2.0968
27	2.8002	1.9735
28	2.7956	1.9443
29	2.7612	1.8957
30	2.7436	1.8938
31	2.7139	1.8796

32	2.6901	1.8703
33	2.6831	1.8603
34	2.6398	1.8113
35	2.5879	1.7514
36	2.5767	1.7332
37	2.5749	1.7027
38	2.5373	1.6133
39	2.4887	1.5850
40	2.4873	1.5286
41	2.4813	1.4771
42	2.4573	1.4062
43	2.4081	1.3959
44	2.3990	1.3852
45	2.3863	1.3111
46	2.3691	1.2965
47	2.3595	1.2860
48	2.3313	1.2736
49	2.3171	1.2662
50	2.2869	1.2571
51	2.2790	1.2494
52	2.2360	1.1793
53	2.2311	1.1770
54	2.1909	1.1246
55	2.0954	1.1174
56	2.0922	1.0871
57	2.0786	1.0131
58	2.0779	0.9069
59	2.0580	0.8286
60	2.0256	0.7413
61	1.8638	0.3780

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2272	67845	386	0	Pass
0.2392	64509	378	0	Pass
0.2512	61279	371	0	Pass
0.2633	58220	361	0	Pass
0.2753	55311	353	0	Pass
0.2874	52574	345	0	Pass
0.2994	50071	335	0	Pass
0.3115	47633	326	0	Pass
0.3235	45366	319	0	Pass
0.3356	43227	309	0	Pass
0.3476	41238	300	0	Pass
0.3597	39334	295	0	Pass
0.3717	37473	292	0	Pass
0.3837	35848	282	0	Pass
0.3958	34137	274	0	Pass
0.4078	32511	265	0	Pass
0.4199	31078	257	0	Pass
0.4319	29623	253	0	Pass

0.4440	28340	248	0	Pass
0.4560	26950	240	0	Pass
0.4681	25774	231	0	Pass
0.4801	24640	224	0	Pass
0.4922	23592	219	0	Pass
0.5042	22608	216	0	Pass
0.5163	21688	207	0	Pass
0.5283	20803	202	0	Pass
0.5403	19870	196	0	Pass
0.5524	19051	191	1	Pass
0.5644	18260	189	1	Pass
0.5765	17509	183	1	Pass
0.5885	16786	180	1	Pass
0.6006	16125	175	1	Pass
0.6126	15453	169	1	Pass
0.6247	14855	160	1	Pass
0.6367	14249	153	1	Pass
0.6488	13687	152	1	Pass
0.6608	13176	150	1	Pass
0.6728	12660	144	1	Pass
0.6849	12187	141	1	Pass
0.6969	11659	136	1	Pass
0.7090	11227	135	1	Pass
0.7210	10744	133	1	Pass
0.7331	10324	129	1	Pass
0.7451	9912	124	1	Pass
0.7572	9531	123	1	Pass
0.7692	9161	122	1	Pass
0.7813	8804	121	1	Pass
0.7933	8500	120	1	Pass
0.8054	8177	119	1	Pass
0.8174	7880	114	1	Pass
0.8294	7610	113	1	Pass
0.8415	7341	109	1	Pass
0.8535	7103	108	1	Pass
0.8656	6857	104	1	Pass
0.8776	6643	103	1	Pass
0.8897	6419	100	1	Pass
0.9017	6201	97	1	Pass
0.9138	5965	97	1	Pass
0.9258	5756	95	1	Pass
0.9379	5535	93	1	Pass
0.9499	5354	89	1	Pass
0.9619	5174	87	1	Pass
0.9740	5011	85	1	Pass
0.9860	4819	85	1	Pass
0.9981	4658	84	1	Pass
1.0101	4490	83	1	Pass
1.0222	4329	82	1	Pass
1.0342	4182	80	1	Pass
1.0463	4042	80	1	Pass
1.0583	3923	77	1	Pass
1.0704	3803	73	1	Pass
1.0824	3668	71	1	Pass
1.0945	3546	66	1	Pass
1.1065	3422	64	1	Pass
1.1185	3317	60	1	Pass

1.1306	3198	59	1	Pass
1.1426	3114	58	1	Pass
1.1547	3033	57	1	Pass
1.1667	2947	57	1	Pass
1.1788	2845	56	1	Pass
1.1908	2766	55	1	Pass
1.2029	2671	52	1	Pass
1.2149	2582	52	2	Pass
1.2270	2483	52	2	Pass
1.2390	2400	50	2	Pass
1.2511	2327	50	2	Pass
1.2631	2261	47	2	Pass
1.2751	2186	45	2	Pass
1.2872	2118	44	2	Pass
1.2992	2056	43	2	Pass
1.3113	1997	42	2	Pass
1.3233	1934	41	2	Pass
1.3354	1863	39	2	Pass
1.3474	1795	39	2	Pass
1.3595	1745	39	2	Pass
1.3715	1688	38	2	Pass
1.3836	1646	38	2	Pass
1.3956	1597	37	2	Pass
1.4076	1543	37	2	Pass
1.4197	1497	36	2	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique   Used for   Total Volumn   Volumn   Infiltration Cumulative
Percent   Water Quality Percent   Comment
                               Treatment? Needs   Through   Volumn   Volumn
Volumn   Water Quality
                                           Treatment   Facility (ac-ft.)   Infiltration
Infiltrated   Treated
                                           (ac-ft)   (ac-ft)   Credit

Sand Filter 1 POC   N   931.90   N   0.00
Total Volume Infiltrated   931.90   0.00   0.00   0.00
0.00   0%   No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

Appendix D

Hydrologic Modeling of SR104 Storm Drainage Diversion

WASHINGTON BOULEVARD ANALYSIS

A large portion of the developed Kingston area is conveyed along Main Street in an undersized drainage system. A project that would move the ferry ingress traffic from NE Main Street to NE 1st Street created an opportunity to install a new conveyance system with adequate capacity within the reconstructed NE 1st Street. This would divert a majority of the runoff away from the constrained system in Main Street. Stormwater concepts were evaluated for sizing of end-of-pipe treatment facilities to be located near Washington Boulevard. This was done for both Projects 1A and 1B. The location of the facility is dependent upon which project is ultimately selected and timing of when that work would occur. The goal of this analysis was to identify the type, size, and location of feasible treatment facilities for each scenario.

WWHM models were developed for preliminary sizing of these two concepts. For each alternative a WWHM analysis was performed in accordance with the Ecology design guidelines. Facilities have been sized to provide treatment for the water quality design event, or 91% of all runoff. As with the Bannister Diversion concepts, these are scalable. Alternatives developed employ the Filterra Bioscape™. Sand filter vaults were considered but required footprints too large to fit within the available space.

The first alternative proposes a facility located at Washington Boulevard and NE 1st Street. There are two potential scenarios for this alternative – a linear facility installed adjacent to Washington Boulevard Park or an area where there is a narrow patch of grass on the Port property that contains the ferry holding lanes. This alternative Is based on the scenario that a new stormwater conveyance system is installed in SR 104 (Northeast 1st Street) directing runoff away from the current routing along Northeast Main Street. Under both scenarios and overflow bypass structure would be required upstream of the treatment facility. Adequate space is not available to treat the entire 136 acres, therefore the facilities are roughly five-eighths the size needed to treat 91% of runoff. That said, a significant portion of that 136 acres is undeveloped and does not generate pollutants, so a scaled down facility would still be effective considering the initial flows from a storm would be from the developed or pollutant-generating areas.

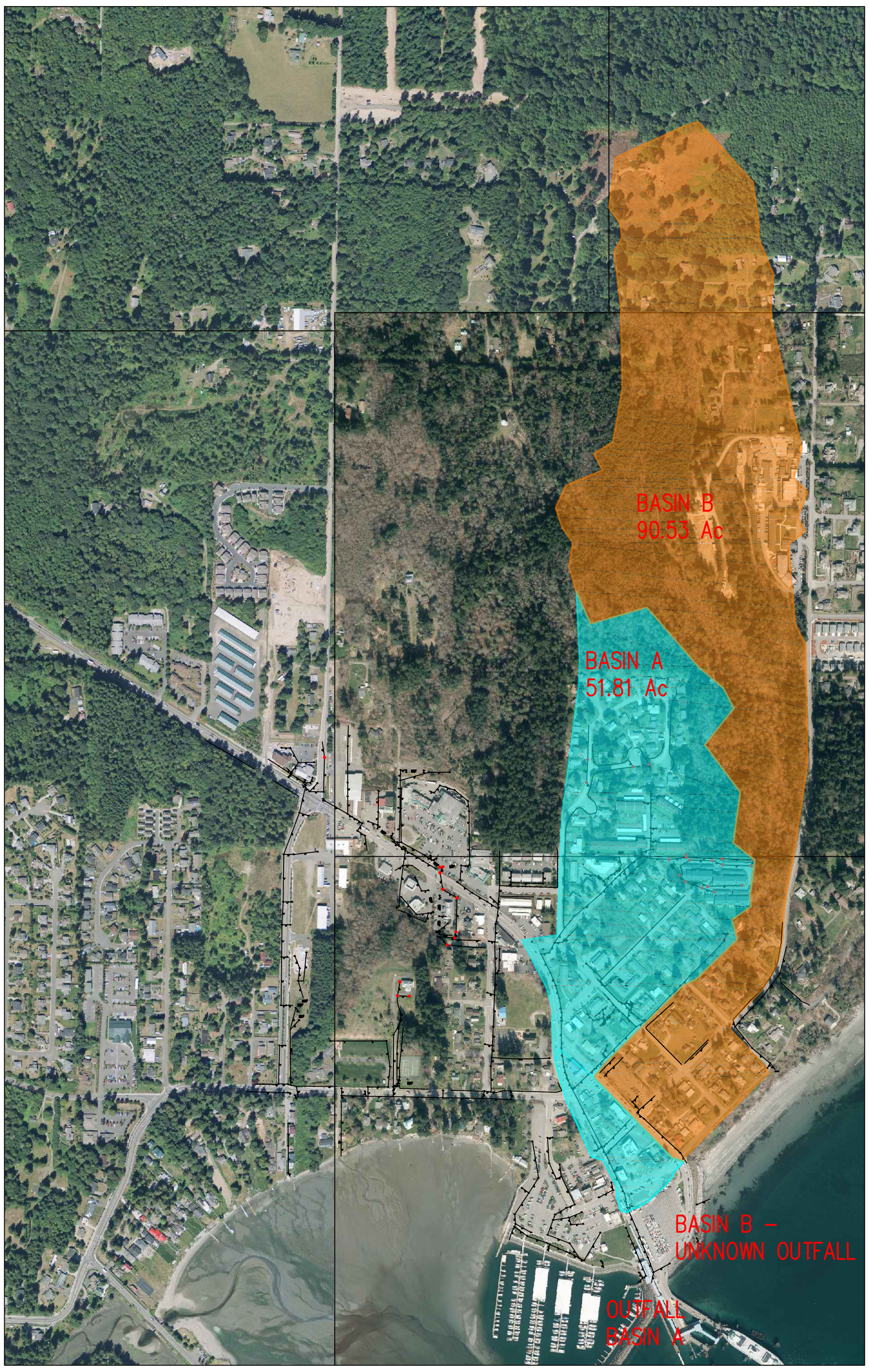
A second alternative is based on the drainage continuing to be routed along Northeast Main Street. Again two options were developed – the first would be to install Bioscape™ facilities within the right of way of Northeast Main Street. This is predicated on the scenario that the ferry ingress is moved and the toll booths are no longer in their current location. The second option would locate a facility in Mike Wallace Park.

The goal of this analysis was to determine feasibility of concept for type, size, and location. There are significant headwinds in implementing some of these concepts. The three that locate facilities on Port property will face the challenge of gaining concurrence. These alternatives will result in impacts to parking stalls and other infrastructure. The Port has indicated that the first alternative described above is not likely to be moved forward.

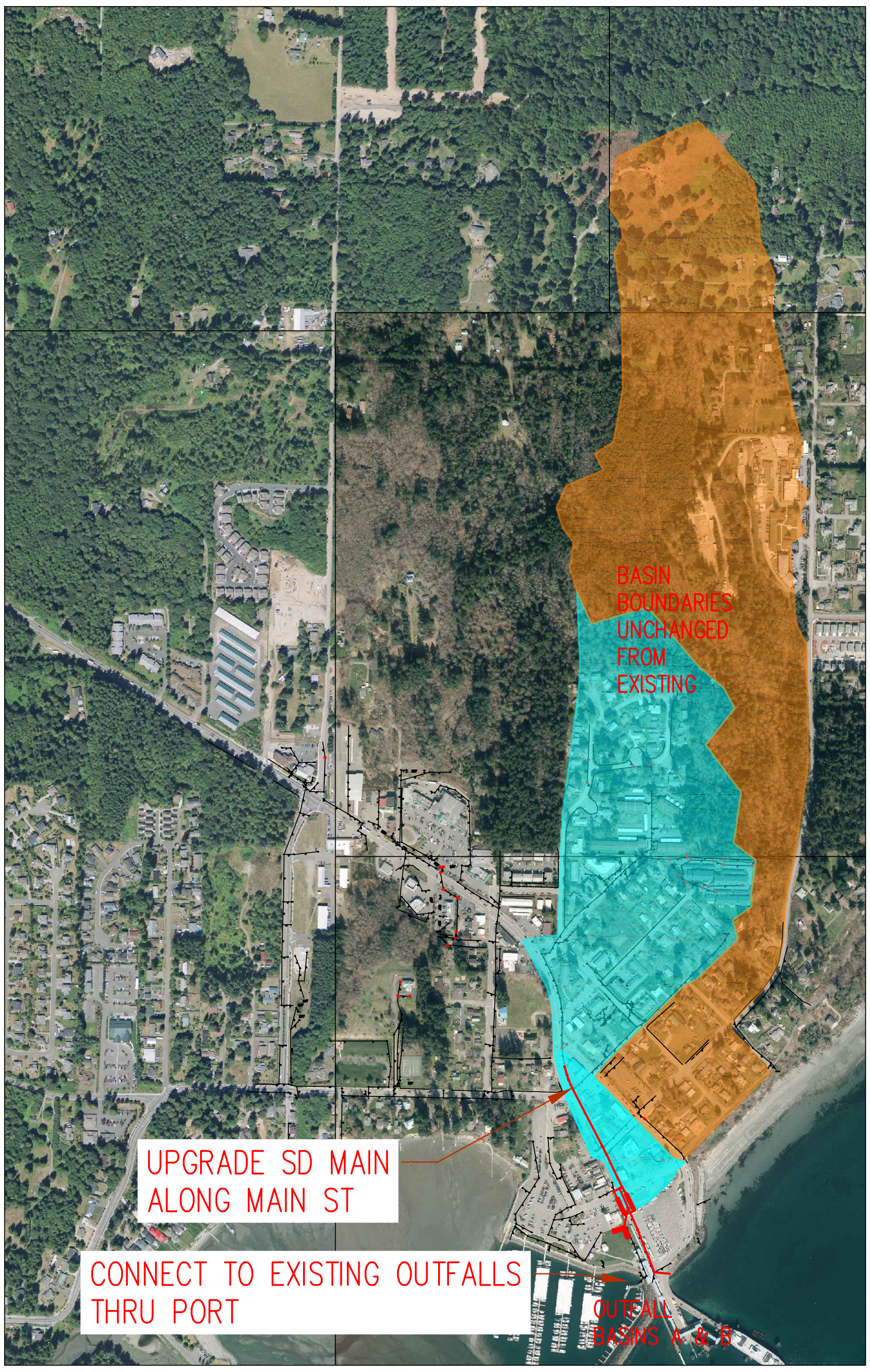
The option under the second alternative to locate a facility in Mike Wallace Park may have a greater likelihood as it is similar to the concepts described in the Bannister Diversion concept. It would require ongoing discussions with the Port to identify a location that was suitable to their needs and desires to maintain the functions of the park.

The one option that would locate facilities in the County right of way again would be feasible only in the event that Washington State Ferries makes changes to their operation and the circulation of SR 104.

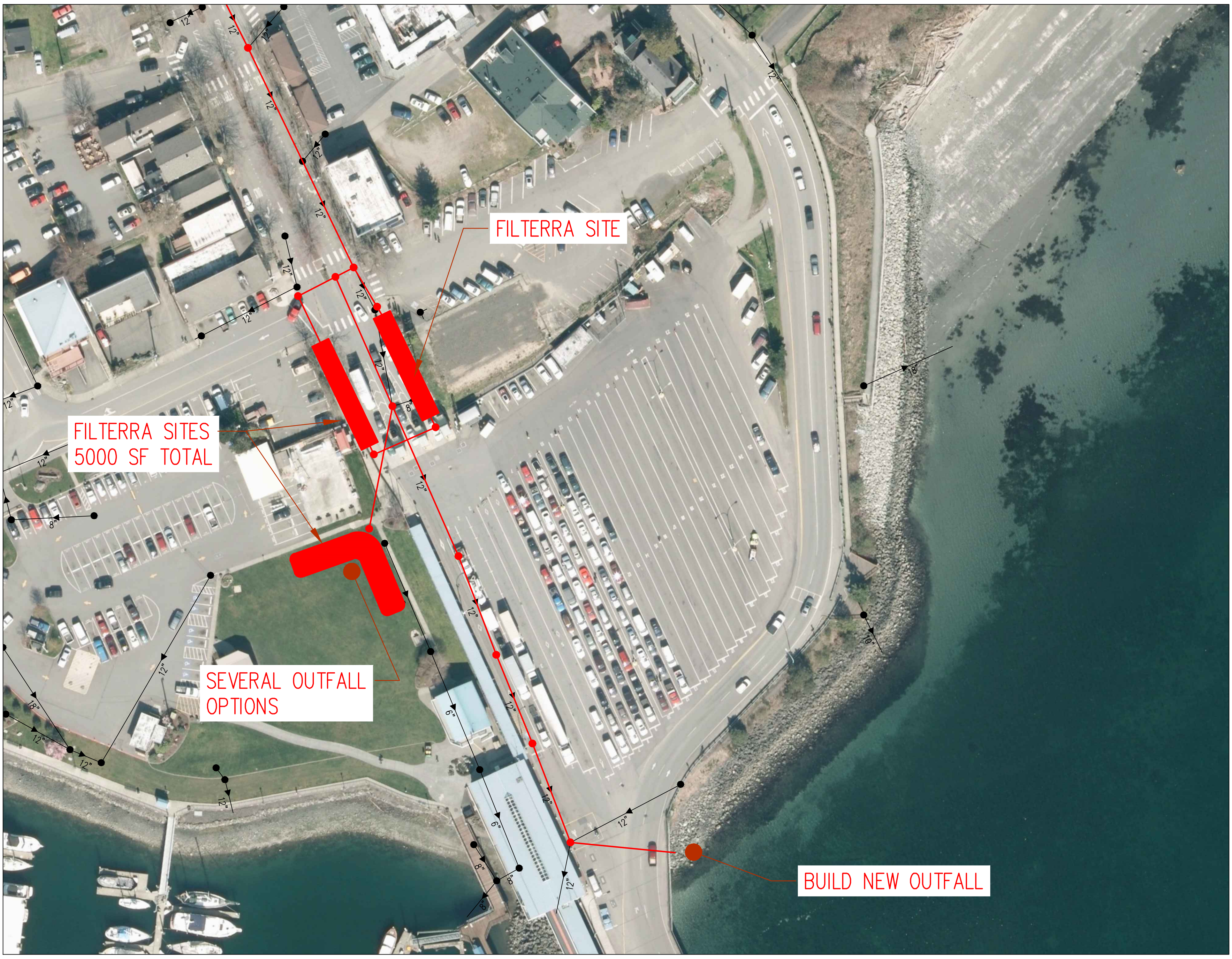
SR 104 – CONVEYANCE UPGRADE FILTERRA OPTIONS



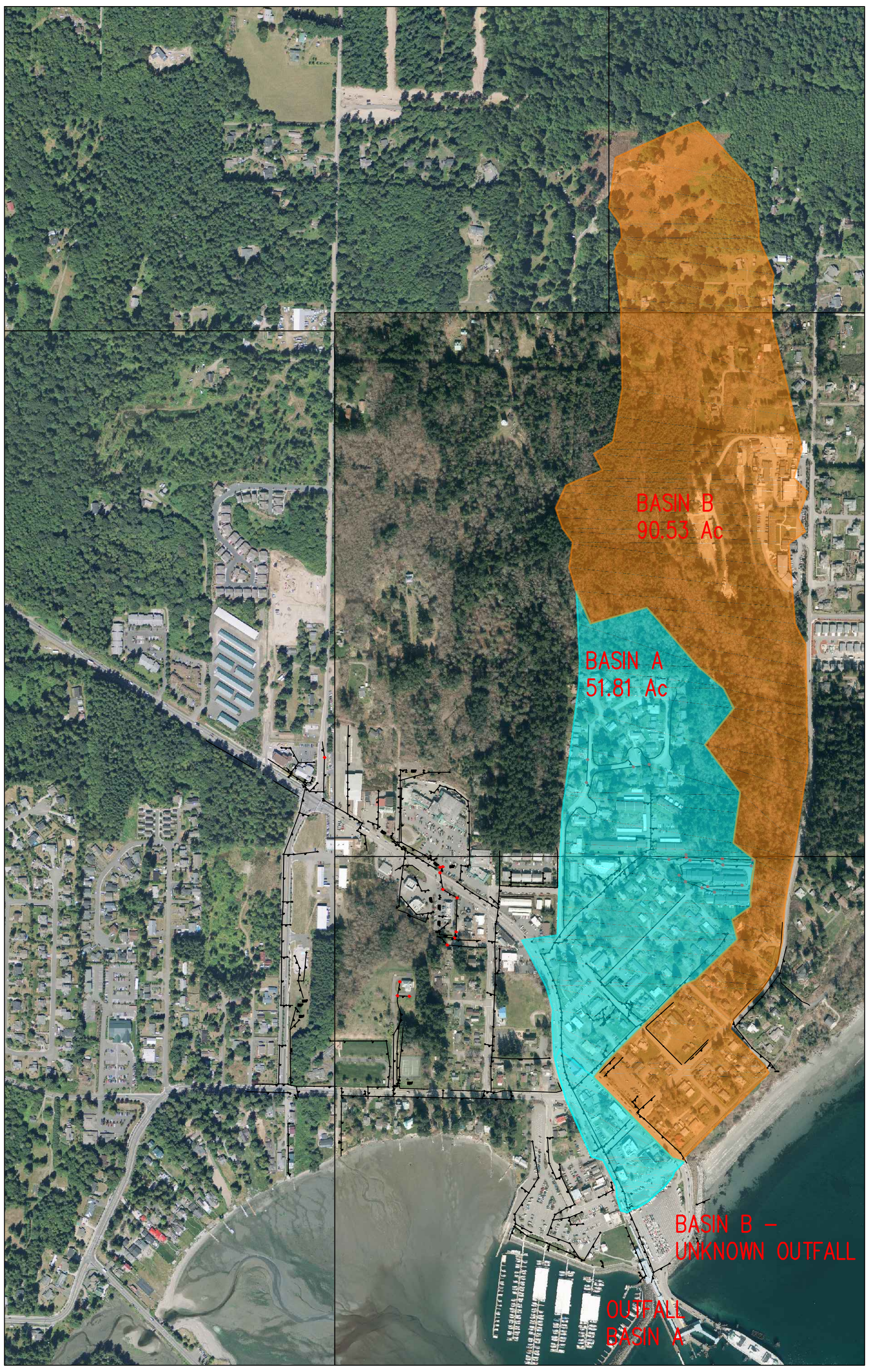
EXISTING BASIN



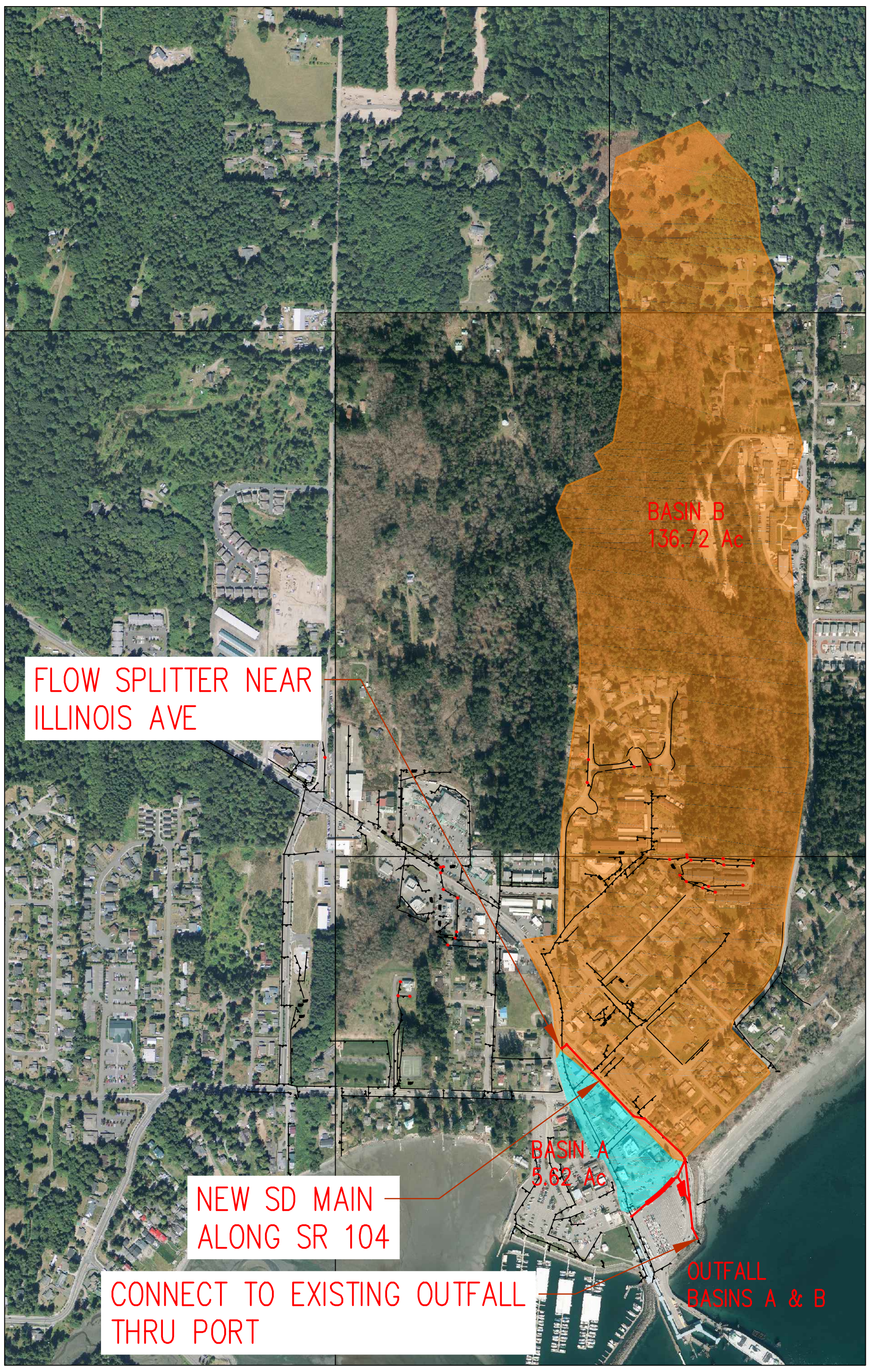
PROPOSED BASIN



SR 104 DIVERSION – FILTERRA OPTION



EXISTING BASIN



PROPOSED BASIN

WWHM2012
PROJECT REPORT

Project Name: Filterra-Proposed A
Site Name:
Site Address:
City :
Report Date: 3/6/2016
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2015/10/20
Version : 4.2.10

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 2 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	11.5
A B, Lawn, Mod	12.94
Pervious Total	24.44

Impervious Land Use	acre
ROADS MOD	27.37
Impervious Total	27.37
Basin Total	51.81

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**11.5**
A B, Lawn, Mod	**12.94**
Pervious Total	**24.44**

Impervious Land Use	**acre**
ROADS MOD	**27.37**
Impervious Total	**27.37**
Basin Total	**51.81**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 1	Sand Filter 1	

Name : Sand Filter 1
Bottom Length: 97.00 ft.
Bottom Width: 50.00 ft.
Depth: 0.75 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Filtration On
Hydraulic conductivity: 70.92
Depth of filter medium: 1.8
Total Volume Infiltrated (ac-ft.): 3357.788
Total Volume Through Riser (ac-ft.): 1.362
Total Volume Through Facility (ac-ft.): 3359.15
Percent Infiltrated: 99.96
Total Precip Applied to Facility: 13.843
Total Evap From Facility: 1.717
Discharge Structure
Riser Height: 0.7 ft.
Riser Diameter: 100 in.

Element Flows To:

Outlet 1	**Outlet 2**
Gravel Trench Bed 1	Gravel Trench Bed 1

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.111	0.000	0.000	0.000
0.0083	0.111	0.000	0.000	7.998
0.0167	0.111	0.001	0.000	8.035

0.0250	0.111	0.002	0.000	8.072
0.0333	0.111	0.003	0.000	8.109
0.0417	0.111	0.004	0.000	8.146
0.0500	0.111	0.005	0.000	8.183
0.0583	0.111	0.006	0.000	8.220
0.0667	0.111	0.007	0.000	8.257
0.0750	0.111	0.008	0.000	8.293
0.0833	0.111	0.009	0.000	8.330
0.0917	0.111	0.010	0.000	8.367
0.1000	0.111	0.011	0.000	8.404
0.1083	0.111	0.012	0.000	8.441
0.1167	0.111	0.013	0.000	8.478
0.1250	0.111	0.013	0.000	8.515
0.1333	0.111	0.014	0.000	8.551
0.1417	0.111	0.015	0.000	8.588
0.1500	0.111	0.016	0.000	8.625
0.1583	0.111	0.017	0.000	8.662
0.1667	0.111	0.018	0.000	8.699
0.1750	0.111	0.019	0.000	8.736
0.1833	0.111	0.020	0.000	8.773
0.1917	0.111	0.021	0.000	8.809
0.2000	0.111	0.022	0.000	8.846
0.2083	0.111	0.023	0.000	8.883
0.2167	0.111	0.024	0.000	8.920
0.2250	0.111	0.025	0.000	8.957
0.2333	0.111	0.026	0.000	8.994
0.2417	0.111	0.026	0.000	9.031
0.2500	0.111	0.027	0.000	9.067
0.2583	0.111	0.028	0.000	9.104
0.2667	0.111	0.029	0.000	9.141
0.2750	0.111	0.030	0.000	9.178
0.2833	0.111	0.031	0.000	9.215
0.2917	0.111	0.032	0.000	9.252
0.3000	0.111	0.033	0.000	9.289
0.3083	0.111	0.034	0.000	9.326
0.3167	0.111	0.035	0.000	9.362
0.3250	0.111	0.036	0.000	9.399
0.3333	0.111	0.037	0.000	9.436
0.3417	0.111	0.038	0.000	9.473
0.3500	0.111	0.039	0.000	9.510
0.3583	0.111	0.039	0.000	9.547
0.3667	0.111	0.040	0.000	9.584
0.3750	0.111	0.041	0.000	9.620
0.3833	0.111	0.042	0.000	9.657
0.3917	0.111	0.043	0.000	9.694
0.4000	0.111	0.044	0.000	9.731
0.4083	0.111	0.045	0.000	9.768
0.4167	0.111	0.046	0.000	9.805
0.4250	0.111	0.047	0.000	9.842
0.4333	0.111	0.048	0.000	9.878
0.4417	0.111	0.049	0.000	9.915
0.4500	0.111	0.050	0.000	9.952
0.4583	0.111	0.051	0.000	9.989
0.4667	0.111	0.052	0.000	10.02
0.4750	0.111	0.052	0.000	10.06
0.4833	0.111	0.053	0.000	10.10
0.4917	0.111	0.054	0.000	10.13

0.5000	0.111	0.055	0.000	10.17
0.5083	0.111	0.056	0.000	10.21
0.5167	0.111	0.057	0.000	10.24
0.5250	0.111	0.058	0.000	10.28
0.5333	0.111	0.059	0.000	10.32
0.5417	0.111	0.060	0.000	10.35
0.5500	0.111	0.061	0.000	10.39
0.5583	0.111	0.062	0.000	10.43
0.5667	0.111	0.063	0.000	10.46
0.5750	0.111	0.064	0.000	10.50
0.5833	0.111	0.064	0.000	10.54
0.5917	0.111	0.065	0.000	10.57
0.6000	0.111	0.066	0.000	10.61
0.6083	0.111	0.067	0.000	10.65
0.6167	0.111	0.068	0.000	10.69
0.6250	0.111	0.069	0.000	10.72
0.6333	0.111	0.070	0.000	10.76
0.6417	0.111	0.071	0.000	10.80
0.6500	0.111	0.072	0.000	10.83
0.6583	0.111	0.073	0.000	10.87
0.6667	0.111	0.074	0.000	10.91
0.6750	0.111	0.075	0.000	10.94
0.6833	0.111	0.076	0.000	10.98
0.6917	0.111	0.077	0.000	11.02
0.7000	0.111	0.077	0.000	11.05
0.7083	0.111	0.078	0.067	11.09
0.7167	0.111	0.079	0.190	11.13
0.7250	0.111	0.080	0.349	11.16
0.7333	0.111	0.081	0.538	11.20
0.7417	0.111	0.082	0.752	11.24
0.7500	0.111	0.083	0.989	11.28
0.7583	0.111	0.084	1.246	11.31

Name : Gravel Trench Bed 1
Bottom Length: 97.00 ft.
Bottom Width: 50.00 ft.
Trench bottom slope 1: 0.001 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 0.167
Pour Space of material for first layer: 0.3
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Discharge Structure
Riser Height: 0.167 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 24 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.111	0.000	0.000	0.000
0.0130	0.111	0.000	1.779	0.000
0.0259	0.111	0.000	2.517	0.000
0.0389	0.111	0.001	3.082	0.000
0.0519	0.111	0.001	3.559	0.000
0.0648	0.111	0.002	3.980	0.000
0.0778	0.111	0.002	4.359	0.000
0.0908	0.111	0.003	4.709	0.000
0.1037	0.111	0.003	5.034	0.000
0.1167	0.111	0.003	5.339	0.000
0.1297	0.111	0.004	5.628	0.000
0.1426	0.111	0.004	5.903	0.000
0.1556	0.111	0.005	6.165	0.000
0.1686	0.111	0.006	6.418	0.000
0.1815	0.111	0.008	6.678	0.000
0.1945	0.111	0.009	6.941	0.000
0.2075	0.111	0.011	7.205	0.000
0.2204	0.111	0.012	7.469	0.000
0.2334	0.111	0.013	7.732	0.000
0.2464	0.111	0.015	7.994	0.000
0.2593	0.111	0.016	8.256	0.000
0.2723	0.111	0.018	8.516	0.000
0.2853	0.111	0.019	8.775	0.000
0.2982	0.111	0.021	9.034	0.000
0.3112	0.111	0.022	9.290	0.000
0.3242	0.111	0.024	9.546	0.000
0.3371	0.111	0.025	9.800	0.000
0.3501	0.111	0.026	10.05	0.000
0.3631	0.111	0.028	10.30	0.000
0.3760	0.111	0.029	10.54	0.000
0.3890	0.111	0.031	10.79	0.000
0.4020	0.111	0.032	11.03	0.000
0.4149	0.111	0.034	11.27	0.000
0.4279	0.111	0.035	11.50	0.000
0.4409	0.111	0.037	11.73	0.000
0.4538	0.111	0.038	11.96	0.000
0.4668	0.111	0.039	12.18	0.000
0.4798	0.111	0.041	12.40	0.000
0.4927	0.111	0.042	12.61	0.000
0.5057	0.111	0.044	12.82	0.000
0.5187	0.111	0.045	13.02	0.000
0.5316	0.111	0.047	13.22	0.000
0.5446	0.111	0.048	13.41	0.000
0.5576	0.111	0.050	13.59	0.000
0.5705	0.111	0.051	13.77	0.000
0.5835	0.111	0.052	13.95	0.000
0.5965	0.111	0.054	14.12	0.000
0.6094	0.111	0.055	14.28	0.000
0.6224	0.111	0.057	14.44	0.000
0.6354	0.111	0.058	14.60	0.000
0.6483	0.111	0.060	14.75	0.000
0.6613	0.111	0.061	14.90	0.000
0.6743	0.111	0.062	15.07	0.000
0.6872	0.111	0.064	15.23	0.000

0.7002	0.111	0.065	15.37	0.000
0.7132	0.111	0.067	15.52	0.000
0.7261	0.111	0.068	15.67	0.000
0.7391	0.111	0.070	15.82	0.000
0.7521	0.111	0.071	15.96	0.000
0.7650	0.111	0.073	16.10	0.000
0.7780	0.111	0.074	16.24	0.000
0.7910	0.111	0.075	16.38	0.000
0.8039	0.111	0.077	16.52	0.000
0.8169	0.111	0.078	16.66	0.000
0.8299	0.111	0.080	16.80	0.000
0.8428	0.111	0.081	16.93	0.000
0.8558	0.111	0.083	17.07	0.000
0.8688	0.111	0.084	17.20	0.000
0.8817	0.111	0.086	17.34	0.000
0.8947	0.111	0.087	17.47	0.000
0.9077	0.111	0.088	17.60	0.000
0.9206	0.111	0.090	17.73	0.000
0.9336	0.111	0.091	17.86	0.000
0.9466	0.111	0.093	17.98	0.000
0.9595	0.111	0.094	18.11	0.000
0.9725	0.111	0.096	18.24	0.000
0.9855	0.111	0.097	18.36	0.000
0.9984	0.111	0.099	18.49	0.000
1.0114	0.111	0.100	18.61	0.000
1.0244	0.111	0.101	18.73	0.000
1.0373	0.111	0.103	18.85	0.000
1.0503	0.111	0.104	18.97	0.000
1.0633	0.111	0.106	19.09	0.000
1.0762	0.111	0.107	19.21	0.000
1.0892	0.111	0.109	19.33	0.000
1.1022	0.111	0.110	19.45	0.000
1.1151	0.111	0.112	19.57	0.000
1.1281	0.111	0.113	19.69	0.000
1.1411	0.111	0.114	19.80	0.000
1.1540	0.111	0.116	19.92	0.000
1.1670	0.111	0.117	20.03	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:24.44
Total Impervious Area:27.37

Mitigated Landuse Totals for POC #1
Total Pervious Area:24.44
Total Impervious Area:27.37

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	9.362102
5 year	11.863106
10 year	13.60153
25 year	15.897228
50 year	17.68229
100 year	19.533773

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	8.587114
5 year	10.43539
10 year	11.703856
25 year	13.360446
50 year	14.635541
100 year	15.947306

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	12.090	10.102
1950	12.663	10.680
1951	7.330	6.853
1952	6.147	6.367
1953	7.373	7.384
1954	7.542	7.429
1955	9.106	8.599
1956	8.180	8.530
1957	9.049	8.331
1958	7.782	7.548
1959	8.532	7.634
1960	8.103	7.267
1961	7.869	8.231
1962	6.910	6.734
1963	8.202	7.613
1964	8.207	7.553
1965	9.235	9.158
1966	6.679	6.819
1967	11.068	9.566
1968	14.395	11.197
1969	8.492	8.503
1970	8.707	7.746
1971	10.555	8.668
1972	10.505	9.696
1973	6.855	6.378
1974	9.892	8.892
1975	10.583	9.468
1976	7.812	6.434
1977	7.911	8.016
1978	11.326	9.258
1979	14.020	11.293
1980	14.029	12.691
1981	9.219	8.725
1982	13.153	11.341
1983	10.861	9.493

1984	6.901	6.947
1985	8.848	8.815
1986	7.941	7.761
1987	12.450	11.531
1988	7.640	7.112
1989	12.178	9.720
1990	11.682	9.402
1991	13.337	10.707
1992	6.852	6.871
1993	7.690	6.359
1994	7.514	7.494
1995	8.368	7.888
1996	10.415	9.706
1997	8.486	8.429
1998	8.950	7.797
1999	19.012	17.547
2000	8.873	8.287
2001	10.850	8.682
2002	11.054	9.929
2003	10.951	10.532
2004	18.285	15.336
2005	7.225	8.152
2006	6.786	7.091
2007	17.208	14.065
2008	12.429	11.073
2009	13.248	11.146

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	19.0115	17.5474
2	18.2853	15.3362
3	17.2082	14.0653
4	14.3946	12.6910
5	14.0294	11.5309
6	14.0201	11.3407
7	13.3369	11.2925
8	13.2476	11.1968
9	13.1534	11.1458
10	12.6630	11.0725
11	12.4495	10.7069
12	12.4291	10.6798
13	12.1779	10.5320
14	12.0895	10.1024
15	11.6817	9.9294
16	11.3259	9.7205
17	11.0676	9.7063
18	11.0538	9.6960
19	10.9508	9.5661
20	10.8613	9.4932
21	10.8500	9.4681
22	10.5834	9.4020
23	10.5546	9.2585
24	10.5054	9.1575
25	10.4148	8.8916
26	9.8916	8.8150

27	9.2350	8.7248
28	9.2195	8.6816
29	9.1057	8.6675
30	9.0488	8.5992
31	8.9497	8.5297
32	8.8727	8.5027
33	8.8483	8.4291
34	8.7069	8.3315
35	8.5319	8.2866
36	8.4918	8.2308
37	8.4861	8.1522
38	8.3678	8.0158
39	8.2069	7.8877
40	8.2020	7.7967
41	8.1799	7.7609
42	8.1030	7.7457
43	7.9413	7.6341
44	7.9110	7.6130
45	7.8690	7.5532
46	7.8121	7.5478
47	7.7819	7.4945
48	7.6896	7.4289
49	7.6399	7.3843
50	7.5421	7.2667
51	7.5137	7.1116
52	7.3734	7.0915
53	7.3301	6.9472
54	7.2252	6.8708
55	6.9102	6.8529
56	6.9011	6.8192
57	6.8548	6.7343
58	6.8518	6.4340
59	6.7858	6.3782
60	6.6794	6.3672
61	6.1466	6.3595

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	**Predev**	**Mit**	**Percentage**	**Pass/Fail**
4.6811	1496	1521	101	Fail
4.7283	1447	1477	102	Fail
4.7756	1403	1421	101	Fail
4.8229	1349	1369	101	Fail
4.8702	1301	1323	101	Fail
4.9175	1264	1294	102	Fail
4.9648	1230	1255	102	Fail
5.0120	1190	1215	102	Fail
5.0593	1142	1175	102	Fail
5.1066	1106	1132	102	Fail
5.1539	1077	1094	101	Fail
5.2012	1038	1059	102	Fail
5.2485	1002	1018	101	Fail

5.2957	976	989	101	Fail
5.3430	945	970	102	Fail
5.3903	915	935	102	Fail
5.4376	894	897	100	Pass
5.4849	867	877	101	Fail
5.5322	841	850	101	Fail
5.5794	815	822	100	Pass
5.6267	789	792	100	Pass
5.6740	756	767	101	Fail
5.7213	727	738	101	Fail
5.7686	706	711	100	Pass
5.8159	674	685	101	Fail
5.8631	644	661	102	Fail
5.9104	621	638	102	Fail
5.9577	606	621	102	Fail
6.0050	589	603	102	Fail
6.0523	569	590	103	Fail
6.0996	538	572	106	Fail
6.1468	520	556	106	Fail
6.1941	508	542	106	Fail
6.2414	502	527	104	Fail
6.2887	490	515	105	Fail
6.3360	478	502	105	Fail
6.3833	467	487	104	Fail
6.4305	460	482	104	Fail
6.4778	445	468	105	Fail
6.5251	433	453	104	Fail
6.5724	426	441	103	Fail
6.6197	417	433	103	Fail
6.6670	408	420	102	Fail
6.7142	398	409	102	Fail
6.7615	384	397	103	Fail
6.8088	369	391	105	Fail
6.8561	357	384	107	Fail
6.9034	341	371	108	Fail
6.9507	335	364	108	Fail
6.9979	327	360	110	Fail
7.0452	316	349	110	Fail
7.0925	305	338	110	Fail
7.1398	297	331	111	Fail
7.1871	290	326	112	Fail
7.2344	285	319	111	Fail
7.2816	280	307	109	Fail
7.3289	273	302	110	Fail
7.3762	264	295	111	Fail
7.4235	260	288	110	Fail
7.4708	252	282	111	Fail
7.5181	250	272	108	Fail
7.5653	242	259	107	Fail
7.6126	234	254	108	Fail
7.6599	226	246	108	Fail
7.7072	220	244	110	Fail
7.7545	216	236	109	Fail
7.8018	213	225	105	Fail
7.8490	210	217	103	Fail
7.8963	203	210	103	Fail
7.9436	199	205	103	Fail

7.9909	197	198	100	Pass
8.0382	194	193	99	Pass
8.0855	191	190	99	Pass
8.1327	182	184	101	Fail
8.1800	177	178	100	Pass
8.2273	174	173	99	Pass
8.2746	171	165	96	Pass
8.3219	165	160	96	Pass
8.3692	163	153	93	Pass
8.4164	158	149	94	Pass
8.4637	155	143	92	Pass
8.5110	148	138	93	Pass
8.5583	147	134	91	Pass
8.6056	145	132	91	Pass
8.6529	141	131	92	Pass
8.7001	136	126	92	Pass
8.7474	131	124	94	Pass
8.7947	127	120	94	Pass
8.8420	125	117	93	Pass
8.8893	121	113	93	Pass
8.9366	121	109	90	Pass
8.9838	119	106	89	Pass
9.0311	117	101	86	Pass
9.0784	113	99	87	Pass
9.1257	110	96	87	Pass
9.1730	106	89	83	Pass
9.2203	103	88	85	Pass
9.2675	98	84	85	Pass
9.3148	97	80	82	Pass
9.3621	94	77	81	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

LID Technique Used for Total Volumn Volumn Infiltration Cumulative
Percent Water Quality Percent Comment
Treatment? Needs Through Volumn Volumn
Volumn Water Quality
Treatment Facility (ac-ft.) Infiltration
Infiltrated Treated
(ac-ft) (ac-ft) Credit

Gravel Trench Bed 1 POC N 3056.90 N 0.00
Sand Filter 1 N 3058.45 N
0.00

Total Volume Infiltrated 6115.35 0.00 0.00 0.00
0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: Filterra
Site Name:
Site Address:
City :
Report Date: 12/14/2015
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2015/10/20
Version : 4.2.10

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 2 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**63.26**
A B, Lawn, Mod	**30.24**
Pervious Total	**93.5**

Impervious Land Use	**acre**
ROADS MOD	**43.22**
Impervious Total	**43.22**
Basin Total	**136.72**

Element Flows To:

Surface	**Interflow**	**Groundwater**

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**63.26**
A B, Lawn, Mod	**30.24**

Pervious Total **93.5**

Impervious Land Use	**acre**
ROADS MOD	**43.22**

Impervious Total **43.22**

Basin Total **136.72**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Sand Filter 1	Sand Filter 1	

Name : Sand Filter 1
Bottom Length: 160.00 ft.
Bottom Width: 50.00 ft.
Depth: 0.75 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1
Filtration On
Hydraulic conductivity: 70.92
Depth of filter medium: 1.8
Total Volume Infiltrated (ac-ft.): 5311.223
Total Volume Through Riser (ac-ft.): 1.387
Total Volume Through Facility (ac-ft.): 5312.61
Percent Infiltrated: 99.97
Total Precip Applied to Facility: 22.822
Total Evap From Facility: 2.822
Discharge Structure
Riser Height: 0.7 ft.
Riser Diameter: 100 in.

Element Flows To:

Outlet 1	**Outlet 2**
Gravel Trench Bed 1	Gravel Trench Bed 1

Sand Filter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.183	0.000	0.000	0.000
0.0083	0.183	0.001	0.000	13.19
0.0167	0.183	0.003	0.000	13.25

0.0250	0.183	0.004	0.000	13.31
0.0333	0.183	0.006	0.000	13.37
0.0417	0.183	0.007	0.000	13.43
0.0500	0.183	0.009	0.000	13.49
0.0583	0.183	0.010	0.000	13.55
0.0667	0.183	0.012	0.000	13.62
0.0750	0.183	0.013	0.000	13.68
0.0833	0.183	0.015	0.000	13.74
0.0917	0.183	0.016	0.000	13.80
0.1000	0.183	0.018	0.000	13.86
0.1083	0.183	0.019	0.000	13.92
0.1167	0.183	0.021	0.000	13.98
0.1250	0.183	0.023	0.000	14.04
0.1333	0.183	0.024	0.000	14.10
0.1417	0.183	0.026	0.000	14.16
0.1500	0.183	0.027	0.000	14.22
0.1583	0.183	0.029	0.000	14.28
0.1667	0.183	0.030	0.000	14.34
0.1750	0.183	0.032	0.000	14.41
0.1833	0.183	0.033	0.000	14.47
0.1917	0.183	0.035	0.000	14.53
0.2000	0.183	0.036	0.000	14.59
0.2083	0.183	0.038	0.000	14.65
0.2167	0.183	0.039	0.000	14.71
0.2250	0.183	0.041	0.000	14.77
0.2333	0.183	0.042	0.000	14.83
0.2417	0.183	0.044	0.000	14.89
0.2500	0.183	0.045	0.000	14.95
0.2583	0.183	0.047	0.000	15.01
0.2667	0.183	0.049	0.000	15.07
0.2750	0.183	0.050	0.000	15.14
0.2833	0.183	0.052	0.000	15.20
0.2917	0.183	0.053	0.000	15.26
0.3000	0.183	0.055	0.000	15.32
0.3083	0.183	0.056	0.000	15.38
0.3167	0.183	0.058	0.000	15.44
0.3250	0.183	0.059	0.000	15.50
0.3333	0.183	0.061	0.000	15.56
0.3417	0.183	0.062	0.000	15.62
0.3500	0.183	0.064	0.000	15.68
0.3583	0.183	0.065	0.000	15.74
0.3667	0.183	0.067	0.000	15.80
0.3750	0.183	0.068	0.000	15.86
0.3833	0.183	0.070	0.000	15.93
0.3917	0.183	0.071	0.000	15.99
0.4000	0.183	0.073	0.000	16.05
0.4083	0.183	0.075	0.000	16.11
0.4167	0.183	0.076	0.000	16.17
0.4250	0.183	0.078	0.000	16.23
0.4333	0.183	0.079	0.000	16.29
0.4417	0.183	0.081	0.000	16.35
0.4500	0.183	0.082	0.000	16.41
0.4583	0.183	0.084	0.000	16.47
0.4667	0.183	0.085	0.000	16.53
0.4750	0.183	0.087	0.000	16.59
0.4833	0.183	0.088	0.000	16.66
0.4917	0.183	0.090	0.000	16.72

0.5000	0.183	0.091	0.000	16.78
0.5083	0.183	0.093	0.000	16.84
0.5167	0.183	0.094	0.000	16.90
0.5250	0.183	0.096	0.000	16.96
0.5333	0.183	0.097	0.000	17.02
0.5417	0.183	0.099	0.000	17.08
0.5500	0.183	0.101	0.000	17.14
0.5583	0.183	0.102	0.000	17.20
0.5667	0.183	0.104	0.000	17.26
0.5750	0.183	0.105	0.000	17.32
0.5833	0.183	0.107	0.000	17.39
0.5917	0.183	0.108	0.000	17.45
0.6000	0.183	0.110	0.000	17.51
0.6083	0.183	0.111	0.000	17.57
0.6167	0.183	0.113	0.000	17.63
0.6250	0.183	0.114	0.000	17.69
0.6333	0.183	0.116	0.000	17.75
0.6417	0.183	0.117	0.000	17.81
0.6500	0.183	0.119	0.000	17.87
0.6583	0.183	0.120	0.000	17.93
0.6667	0.183	0.122	0.000	17.99
0.6750	0.183	0.124	0.000	18.05
0.6833	0.183	0.125	0.000	18.11
0.6917	0.183	0.127	0.000	18.18
0.7000	0.183	0.128	0.000	18.24
0.7083	0.183	0.130	0.067	18.30
0.7167	0.183	0.131	0.190	18.36
0.7250	0.183	0.133	0.349	18.42
0.7333	0.183	0.134	0.538	18.48
0.7417	0.183	0.136	0.752	18.54
0.7500	0.183	0.137	0.989	18.60
0.7583	0.183	0.139	1.246	18.66

Name : Gravel Trench Bed 1
Bottom Length: 150.00 ft.
Bottom Width: 50.00 ft.
Trench bottom slope 1: 0.001 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 0.167
Pour Space of material for first layer: 0.3
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Discharge Structure
Riser Height: 0.167 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 24 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.172	0.000	0.000	0.000
0.0130	0.172	0.000	1.779	0.000
0.0259	0.172	0.001	2.517	0.000
0.0389	0.172	0.002	3.082	0.000
0.0519	0.172	0.002	3.559	0.000
0.0648	0.172	0.003	3.980	0.000
0.0778	0.172	0.004	4.359	0.000
0.0908	0.172	0.004	4.709	0.000
0.1037	0.172	0.005	5.034	0.000
0.1167	0.172	0.006	5.339	0.000
0.1297	0.172	0.006	5.628	0.000
0.1426	0.172	0.007	5.903	0.000
0.1556	0.172	0.008	6.165	0.000
0.1686	0.172	0.010	6.418	0.000
0.1815	0.172	0.012	6.678	0.000
0.1945	0.172	0.014	6.941	0.000
0.2075	0.172	0.017	7.205	0.000
0.2204	0.172	0.019	7.469	0.000
0.2334	0.172	0.021	7.732	0.000
0.2464	0.172	0.023	7.994	0.000
0.2593	0.172	0.025	8.256	0.000
0.2723	0.172	0.028	8.516	0.000
0.2853	0.172	0.030	8.775	0.000
0.2982	0.172	0.032	9.034	0.000
0.3112	0.172	0.034	9.290	0.000
0.3242	0.172	0.037	9.546	0.000
0.3371	0.172	0.039	9.800	0.000
0.3501	0.172	0.041	10.05	0.000
0.3631	0.172	0.043	10.30	0.000
0.3760	0.172	0.046	10.54	0.000
0.3890	0.172	0.048	10.79	0.000
0.4020	0.172	0.050	11.03	0.000
0.4149	0.172	0.052	11.27	0.000
0.4279	0.172	0.054	11.50	0.000
0.4409	0.172	0.057	11.73	0.000
0.4538	0.172	0.059	11.96	0.000
0.4668	0.172	0.061	12.18	0.000
0.4798	0.172	0.063	12.40	0.000
0.4927	0.172	0.066	12.61	0.000
0.5057	0.172	0.068	12.82	0.000
0.5187	0.172	0.070	13.02	0.000
0.5316	0.172	0.072	13.22	0.000
0.5446	0.172	0.075	13.41	0.000
0.5576	0.172	0.077	13.59	0.000
0.5705	0.172	0.079	13.77	0.000
0.5835	0.172	0.081	13.95	0.000
0.5965	0.172	0.083	14.12	0.000
0.6094	0.172	0.086	14.28	0.000
0.6224	0.172	0.088	14.44	0.000
0.6354	0.172	0.090	14.60	0.000
0.6483	0.172	0.092	14.75	0.000
0.6613	0.172	0.095	14.90	0.000
0.6743	0.172	0.097	15.07	0.000
0.6872	0.172	0.099	15.23	0.000

0.7002	0.172	0.101	15.37	0.000
0.7132	0.172	0.104	15.52	0.000
0.7261	0.172	0.106	15.67	0.000
0.7391	0.172	0.108	15.82	0.000
0.7521	0.172	0.110	15.96	0.000
0.7650	0.172	0.113	16.10	0.000
0.7780	0.172	0.115	16.24	0.000
0.7910	0.172	0.117	16.38	0.000
0.8039	0.172	0.119	16.52	0.000
0.8169	0.172	0.121	16.66	0.000
0.8299	0.172	0.124	16.80	0.000
0.8428	0.172	0.126	16.93	0.000
0.8558	0.172	0.128	17.07	0.000
0.8688	0.172	0.130	17.20	0.000
0.8817	0.172	0.133	17.34	0.000
0.8947	0.172	0.135	17.47	0.000
0.9077	0.172	0.137	17.60	0.000
0.9206	0.172	0.139	17.73	0.000
0.9336	0.172	0.142	17.86	0.000
0.9466	0.172	0.144	17.98	0.000
0.9595	0.172	0.146	18.11	0.000
0.9725	0.172	0.148	18.24	0.000
0.9855	0.172	0.150	18.36	0.000
0.9984	0.172	0.153	18.49	0.000
1.0114	0.172	0.155	18.61	0.000
1.0244	0.172	0.157	18.73	0.000
1.0373	0.172	0.159	18.85	0.000
1.0503	0.172	0.162	18.97	0.000
1.0633	0.172	0.164	19.09	0.000
1.0762	0.172	0.166	19.21	0.000
1.0892	0.172	0.168	19.33	0.000
1.1022	0.172	0.171	19.45	0.000
1.1151	0.172	0.173	19.57	0.000
1.1281	0.172	0.175	19.69	0.000
1.1411	0.172	0.177	19.80	0.000
1.1540	0.172	0.179	19.92	0.000
1.1670	0.172	0.182	20.03	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:93.5
Total Impervious Area:43.22

Mitigated Landuse Totals for POC #1
Total Pervious Area:93.5
Total Impervious Area:43.22

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	14.797932
5 year	18.745253
10 year	21.488338
25 year	25.110057
50 year	27.925711
100 year	30.84574

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	12.952054
5 year	15.561093
10 year	17.301103
25 year	19.524291
50 year	21.203079
100 year	22.904505

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	19.092	15.596
1950	19.998	16.376
1951	11.655	10.462
1952	9.715	9.472
1953	11.645	10.610
1954	11.946	11.034
1955	14.388	13.444
1956	12.924	13.088
1957	14.317	12.898
1958	12.310	10.960
1959	13.480	11.291
1960	12.796	11.116
1961	12.426	12.105
1962	10.918	10.453
1963	12.952	11.995
1964	12.961	11.841
1965	14.604	13.397
1966	10.548	10.116
1967	17.488	14.796
1968	22.746	16.566
1969	13.425	13.115
1970	13.785	11.747
1971	16.702	13.604
1972	16.641	14.980
1973	10.829	9.499
1974	15.650	12.895
1975	16.713	14.695
1976	12.337	9.873
1977	12.493	11.542
1978	17.888	14.256
1979	22.142	16.859
1980	22.158	17.198
1981	14.574	13.487
1982	20.795	16.696
1983	17.157	14.317

1984	10.931	10.327
1985	13.980	13.213
1986	12.547	12.193
1987	19.661	17.387
1988	12.067	11.110
1989	19.230	14.651
1990	18.452	14.460
1991	21.063	16.192
1992	10.820	9.994
1993	12.179	10.074
1994	11.870	10.845
1995	13.228	11.989
1996	16.491	13.596
1997	13.432	13.198
1998	14.138	11.990
1999	30.048	24.698
2000	14.048	12.928
2001	17.135	13.494
2002	17.456	15.034
2003	17.295	14.010
2004	28.876	21.301
2005	11.420	11.725
2006	10.742	10.555
2007	27.175	20.954
2008	19.628	17.067
2009	20.920	16.049

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	30.0480	24.6981
2	28.8757	21.3006
3	27.1746	20.9542
4	22.7460	17.3866
5	22.1579	17.1984
6	22.1422	17.0671
7	21.0628	16.8591
8	20.9204	16.6963
9	20.7952	16.5660
10	19.9982	16.3760
11	19.6608	16.1918
12	19.6277	16.0493
13	19.2302	15.5958
14	19.0924	15.0343
15	18.4518	14.9803
16	17.8879	14.7959
17	17.4880	14.6953
18	17.4556	14.6512
19	17.2952	14.4599
20	17.1574	14.3172
21	17.1354	14.2563
22	16.7127	14.0096
23	16.7017	13.6039
24	16.6407	13.5960
25	16.4908	13.4944
26	15.6497	13.4873

27	14.6042	13.4442
28	14.5737	13.3972
29	14.3875	13.2127
30	14.3169	13.1983
31	14.1378	13.1147
32	14.0476	13.0880
33	13.9804	12.9283
34	13.7851	12.8978
35	13.4795	12.8952
36	13.4322	12.1928
37	13.4254	12.1054
38	13.2284	11.9951
39	12.9606	11.9904
40	12.9522	11.9894
41	12.9243	11.8411
42	12.7957	11.7470
43	12.5466	11.7253
44	12.4925	11.5419
45	12.4262	11.2911
46	12.3365	11.1156
47	12.3097	11.1096
48	12.1788	11.0342
49	12.0674	10.9597
50	11.9457	10.8449
51	11.8695	10.6097
52	11.6550	10.5550
53	11.6448	10.4623
54	11.4200	10.4525
55	10.9305	10.3270
56	10.9183	10.1158
57	10.8292	10.0744
58	10.8202	9.9939
59	10.7422	9.8729
60	10.5477	9.4995
61	9.7149	9.4720

Stream Protection Duration
POC #1
The Facility PASSED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
7.3990	1500	1528	101	Fail
7.4737	1449	1461	100	Pass
7.5484	1403	1403	100	Pass
7.6232	1355	1348	99	Pass
7.6979	1306	1293	99	Pass
7.7727	1267	1243	98	Pass
7.8474	1232	1203	97	Pass
7.9221	1191	1165	97	Pass
7.9969	1145	1127	98	Pass
8.0716	1110	1094	98	Pass
8.1463	1076	1053	97	Pass
8.2211	1043	1019	97	Pass
8.2958	1006	983	97	Pass

8.3705	978	952	97	Pass
8.4453	948	928	97	Pass
8.5200	921	896	97	Pass
8.5948	895	875	97	Pass
8.6695	868	847	97	Pass
8.7442	845	819	96	Pass
8.8190	816	788	96	Pass
8.8937	794	760	95	Pass
8.9684	759	730	96	Pass
9.0432	729	707	96	Pass
9.1179	708	681	96	Pass
9.1927	677	653	96	Pass
9.2674	647	638	98	Pass
9.3421	623	617	99	Pass
9.4169	608	602	99	Pass
9.4916	589	587	99	Pass
9.5663	573	575	100	Pass
9.6411	543	557	102	Fail
9.7158	519	538	103	Fail
9.7906	508	526	103	Fail
9.8653	502	513	102	Fail
9.9400	491	504	102	Fail
10.0148	482	489	101	Fail
10.0895	470	478	101	Fail
10.1642	463	459	99	Pass
10.2390	449	445	99	Pass
10.3137	435	431	99	Pass
10.3884	429	419	97	Pass
10.4632	420	400	95	Pass
10.5379	409	389	95	Pass
10.6127	399	376	94	Pass
10.6874	389	368	94	Pass
10.7621	370	358	96	Pass
10.8369	358	350	97	Pass
10.9116	345	339	98	Pass
10.9863	337	325	96	Pass
11.0611	332	319	96	Pass
11.1358	320	307	95	Pass
11.2106	308	295	95	Pass
11.2853	298	286	95	Pass
11.3600	290	279	96	Pass
11.4348	285	272	95	Pass
11.5095	284	265	93	Pass
11.5842	275	259	94	Pass
11.6590	269	251	93	Pass
11.7337	260	244	93	Pass
11.8085	252	236	93	Pass
11.8832	249	233	93	Pass
11.9579	245	229	93	Pass
12.0327	235	221	94	Pass
12.1074	227	215	94	Pass
12.1821	221	210	95	Pass
12.2569	216	206	95	Pass
12.3316	213	205	96	Pass
12.4063	211	197	93	Pass
12.4811	204	186	91	Pass
12.5558	200	180	90	Pass

12.6306	200	172	86	Pass
12.7053	196	167	85	Pass
12.7800	190	163	85	Pass
12.8548	184	160	86	Pass
12.9295	179	155	86	Pass
13.0042	174	153	87	Pass
13.0790	171	149	87	Pass
13.1537	165	145	87	Pass
13.2285	164	138	84	Pass
13.3032	160	135	84	Pass
13.3779	156	130	83	Pass
13.4527	148	126	85	Pass
13.5274	147	119	80	Pass
13.6021	144	117	81	Pass
13.6769	141	114	80	Pass
13.7516	136	112	82	Pass
13.8264	130	110	84	Pass
13.9011	126	105	83	Pass
13.9758	126	103	81	Pass
14.0506	121	101	83	Pass
14.1253	121	97	80	Pass
14.2000	119	94	78	Pass
14.2748	118	91	77	Pass
14.3495	113	87	76	Pass
14.4242	111	84	75	Pass
14.4990	107	81	75	Pass
14.5737	104	80	76	Pass
14.6485	98	75	76	Pass
14.7232	97	69	71	Pass
14.7979	95	68	71	Pass

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

```
LID Technique                Used for    Total Volumn   Volumn    Infiltration  Cumulative
Percent     Water Quality  Percent       Comment
                             Treatment?  Needs          Through   Volumn        Volumn
Volumn                     Water Quality
                                         Treatment      Facility  (ac-ft.)       Infiltration
Infiltrated                Treated
                                         (ac-ft)        (ac-ft)                 Credit
Gravel Trench Bed 1 POC            N      4834.49                                  N      0.00
Sand Filter  1                     N      4835.74                                  N
0.00
Total Volume Infiltrated                  9670.24        0.00      0.00                   0.00
0.00           0%            No Treat. Credit
Compliance with LID Standard 8
```

Duration Analysis Result = Passed

Perlnd and Implnd Changes

No changes have been made.

Appendix E

Basis of Cost Estimating Stormwater and Utility Infrastructure

BASIS OF COST ESTIMATING STORMWATER AND UTILITY INFRASTRUCTURE

Conveyance Systems

Much of the existing drainage system within the Kingston core has been identified in this study as undersized with the existing outfalls to the Sound only 12-inches in diameter. The work associated with the stormwater infrastructure for each of these projects is primarily replacement of the conveyances systems to accommodate the new roadway prism. Estimation of the necessary stormwater infrastructure examined the existing drainage patterns to maintain the existing discharge locations.

Unit costs for storm drainage pipe includes all work to install the pipe including trenching, backfill and pavement restoration where needed.

Flow Control Requirements

Given the proximity of these projects to Puget Sound, detention would not typically be required. However, the sequence and timing of projects has an influence on the mitigation of flow control. If a project further from the shoreline were to proceed prior to upgrade of any outfalls, mitigation for increased flows may be appropriate. It has been assumed that this would be done only for the increase in impervious areas to maintain the pre-project conditions. It would not be applied to existing or replaced impervious areas. If a project to replace an outfall was to precede the projects identified in this study, then the detention would not be required for the projects in this study.

Most of these projects will not add a significant amount of new impervious area, but will simply replace the existing pavement that is there (i.e. replace shoulder with sidewalk). Whether existing roadway pavement is replaced or simply overlaid was based on the assumption applied for the roadway improvements. In terms of the Ecology Minimum Requirements that would apply to mitigation of runoff from these projects, only the new pavement would require mitigation for flow control, not replaced pavement (provided the new impervious does not exceed 50-percent of existing which is mostly the case here). Projects were evaluated for increases in impervious areas to determine the applicable areas that would require flow control or water quality treatment. Estimates for flow control are based on the estimated volume of runoff to be detained and include planning level costs for a tank or vault, including the necessary appurtenances such as flow control structures.

Treatment Requirements

For a typical redevelopment project such as these, the increase in impervious areas would require mitigation for increase in runoff. In terms of water quality treatment, the new impervious is typically sidewalk, so water quality treatment would not be required. A goal of this study was to identify opportunities for implementation of Low Impact Development. Many have been included in these projects and other opportunities identified, however these would be considered elective and therefore no additional treatment has been estimated beyond the LID proposed. Only a single project exceeded the threshold for requiring water quality treatment, and bioretention was already included in the project.

Utilities

There is little information available on the existing utilities within the Kingston core area. Survey information is limited and County GIS data does not include utilities. The County provides domestic water and sanitary sewer to the area and there exists franchise utilities including electrical (overhead and buried), telecom, and gas. For the purpose of estimating, utility improvements have not been included in these estimates. There are no known deficiencies in the County systems. At the time of these projects are funded there would be an opportunity to evaluate the age and condition of these facilities and determine the need for an upgrade.

The estimate does include an allowance to cover costs such as adjustments of utilities to final grade. This allowance is based on engineering judgment of the number of valve boxes and manholes would be within the segment of a particular project limits based on the length of the project.

Franchise utilities that are within the County right of way are subject to relocation at their own expense to accommodate the project design. If they are in an easement on private property, the County would be responsible for the cost of the relocation as well as replacement of the easement. These projects will not result in significant right of way impacts and therefore relocation costs of private utilities are anticipated to be borne by the utility providers for these projects.

Appendix B.4. Economic Development

The information contained in this Appendix is organized in the following subsections:

Population Projections

Socioeconomic Characteristics 2009-2013

American Community Survey 2009-2013

Retail Sales Projections

Retail Sales Leakage in 2013 by NAICS Industry

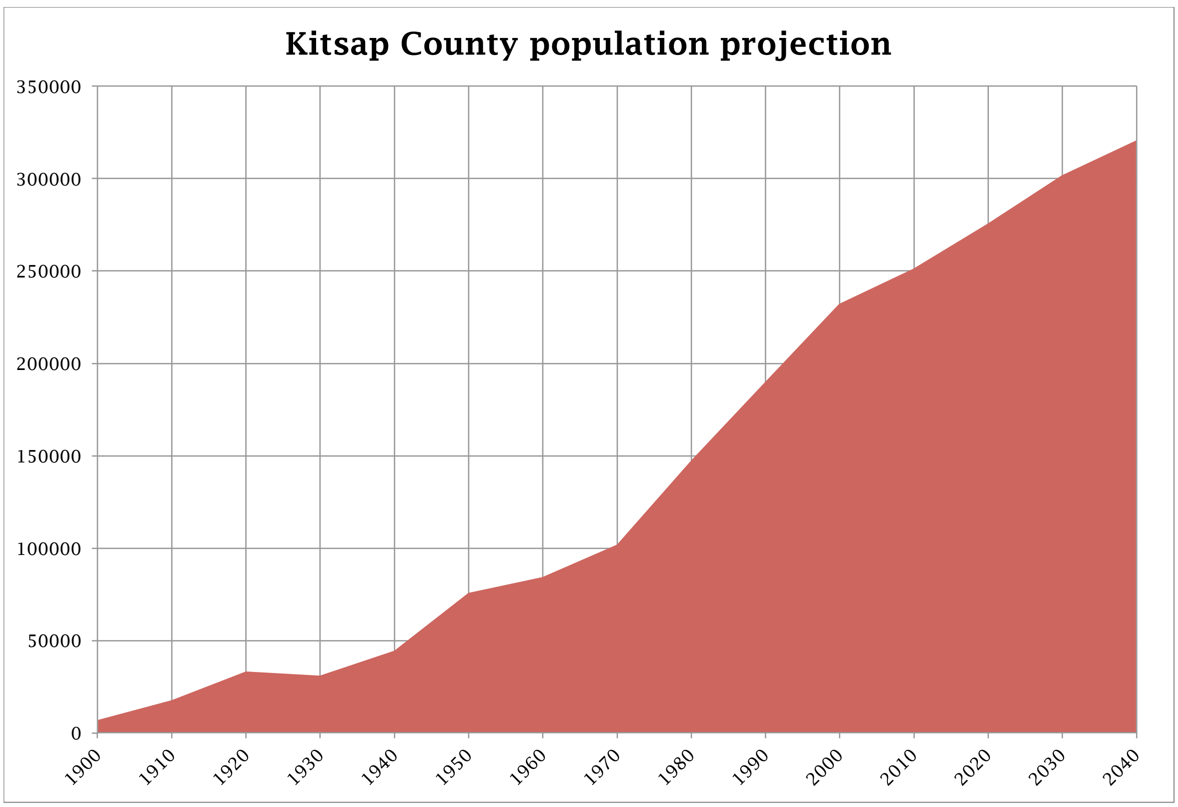
Catalytic Site Envelope Analysis

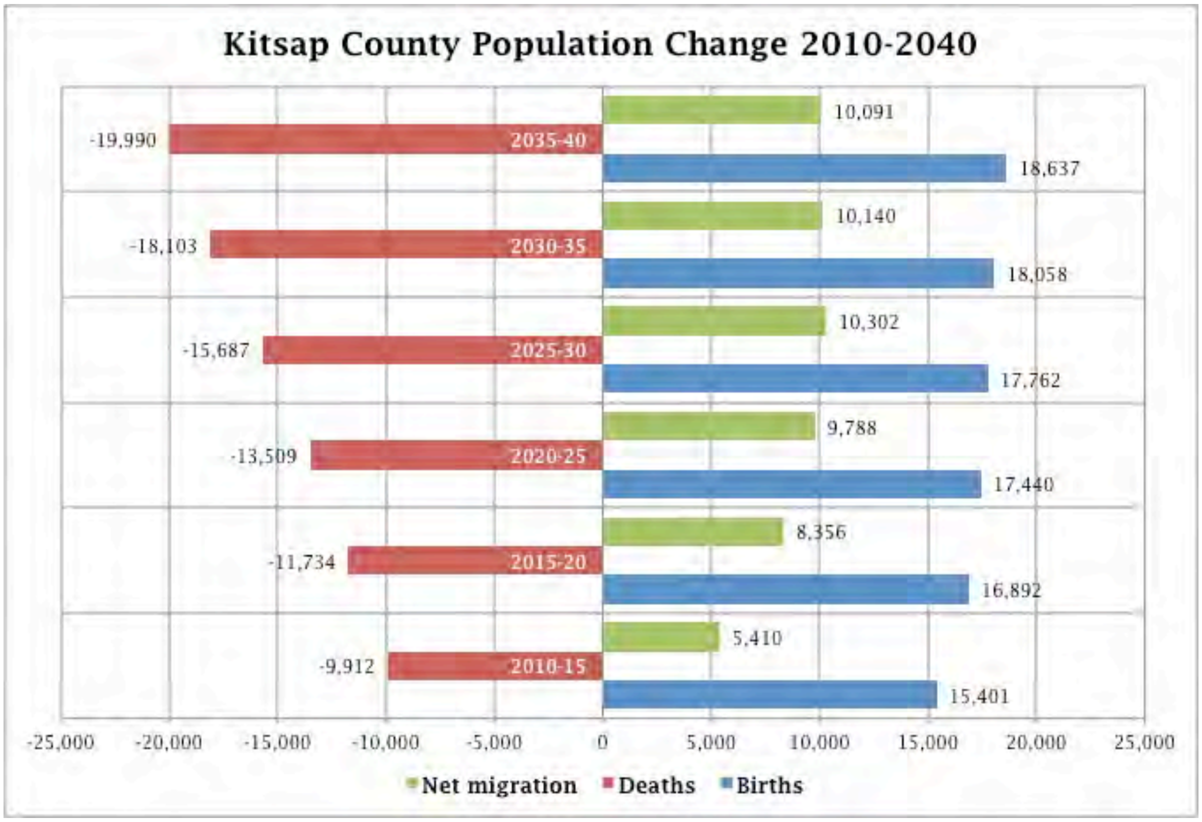
Boutique Hotel Prototypes

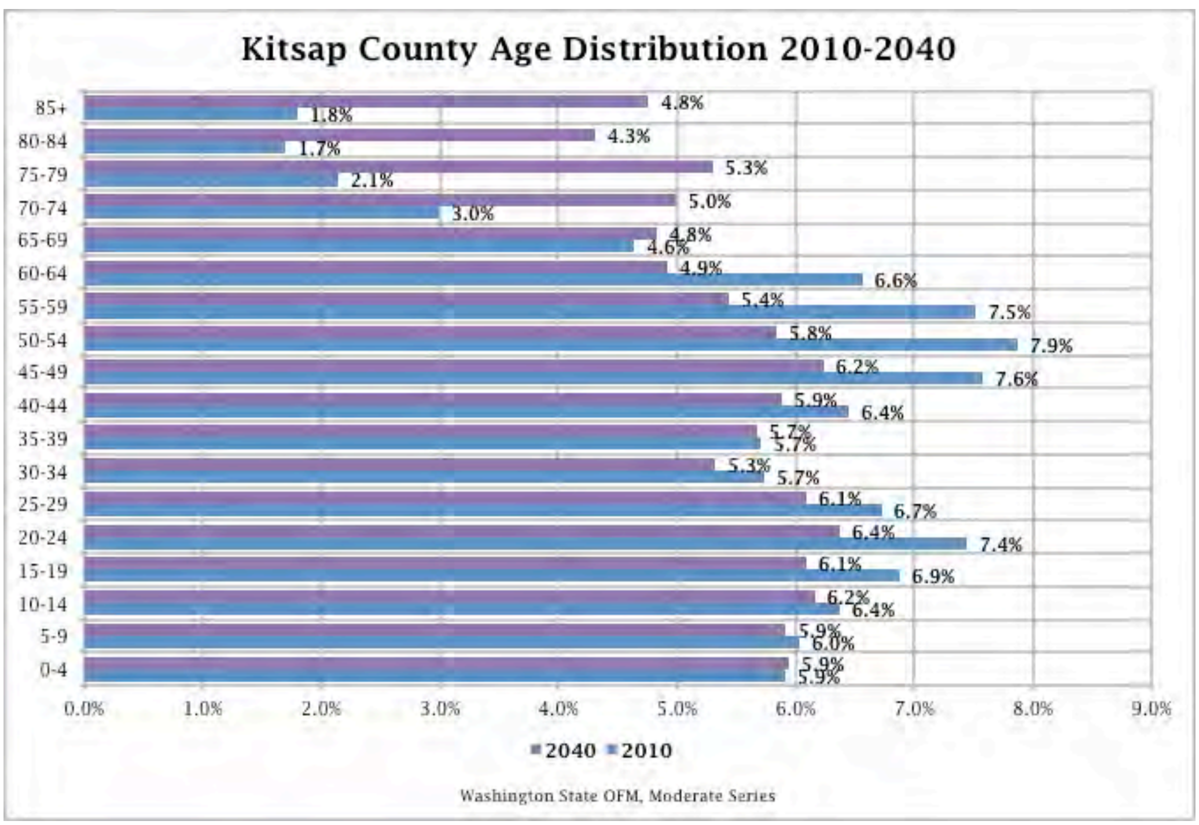
Population projections

Washington State Office of Financial Management (OFM) projects populations for the state and all counties in annual and 5 year increments based on a combination of birth, death, and migration rates. OFM's projections are used by each county and in turn by the jurisdictions within each county in developing each jurisdiction's Growth Management Act (GMA) mandated comprehensive plans.

OFM expects Kitsap County's number of deaths will gradually surpass the number of births as the county's resident population ages beyond child bearing and middle family households for the period 2010 to 2040. Kitsap County will continue to increase in population from net migration that will increase from 5,410 persons for the 2010-2015 period to 10,091 persons by the 2035-2040 period.




Kitsap County Population Change 2010-2040
10,091
-19,990
2035-40
18,637
10,140
-18,103
2030-35
18,058
10,302
-15,687
2025-30
17,762
9,788
-13,509
2020-25
17,440
8,356
-11,734
2015-20
16,892
5,410
-9,912
2010-15
15,401
-25,000 -20,000 -15,000 -10,000 -5,000 0 5,000 10,000 15,000 20,000 25,000
Net migration
Deaths
Births


Kitsap County Age Distribution 2010-2040
85+ 4.8% 1.8%
80-84 4.3% 1.7%
75-79 5.3% 2.1%
70-74 5.0% 3.0%
65-69 4.8% 4.6%
60-64 4.9% 6.6%
55-59 5.4% 7.5%
50-54 5.8% 7.9%
45-49 6.2% 7.6%
40-44 5.9% 6.4%
35-39 5.7% 5.7%
30-34 5.3% 5.7%
25-29 6.1% 6.7%
20-24 6.4% 7.4%
15-19 6.1% 6.9%
10-14 6.2% 6.4%
5-9 5.9% 6.0%
0-4 5.9% 5.9%
0.0% 1.0% 2.0% 3.0% 4.0% 5.0% 6.0% 7.0% 8.0% 9.0%
2040
2010
Washington State OFM, Moderate Series

Population projections

	United States	Washington State	Puget Sound (King/Kitsap/Pier	Kitsap County
Historical				
1900	76,094,000	518,100	196,285	6,767
1910	92,407,000	1,142,000	482,306	17,647
1920	106,466,000	1,356,600	634,252	33,162
1930	123,077,000	1,563,400	736,996	30,776
1940	132,594,000	1,736,200	820,202	44,387
1950	152,271,000	2,379,000	1,196,172	75,724
1960	180,671,000	2,853,200	1,512,979	84,176
1970	204,879,000	3,413,300	1,938,687	101,732
1980	226,500,000	4,132,200	2,240,437	147,152
1990	250,410,000	4,866,663	3,748,867	189,731
2000	268,266,000	5,894,121	3,275,857	231,969
2010	308,745,538	6,724,540	3,690,942	251,133
2015	320,816,867	7,022,200	3,857,116	262,032
Projections				
2020	334,123,000	7,411,977	4,065,940	275,546
2025	346,655,000	7,793,173	4,267,318	289,265
2030	358,407,000	8,154,193	4,455,210	301,642
2035	369,339,000	8,483,628	4,624,208	311,737
2040	379,551,000	8,790,981	4,779,300	320,475
Average annual rate of growth				
1900-1910	2.0%	8.2%	9.4%	10.1%
1910-1920	1.4%	1.7%	2.8%	6.5%
1920-1930	1.5%	1.4%	1.5%	-0.7%
1930-1940	0.7%	1.1%	1.1%	3.7%
1940-1950	1.4%	3.2%	3.8%	5.5%
1950-1960	1.7%	1.8%	2.4%	1.1%
1960-1970	1.3%	1.8%	2.5%	1.9%
1970-1980	1.0%	1.9%	1.5%	3.8%
1980-1990	1.0%	1.6%	5.3%	2.6%
1990-2000	0.7%	1.9%	-1.3%	2.0%
2000-2010	1.4%	1.3%	1.2%	0.8%
2010-2015	0.8%	0.9%	0.9%	0.9%
Projected average annual rate				
2015-2020	0.8%	1.1%	1.1%	1.0%
2020-2025	0.7%	1.0%	1.0%	1.0%
2025-2030	0.7%	0.9%	0.9%	0.8%
2030-2035	0.6%	0.8%	0.7%	0.7%
2035-2040	0.5%	0.7%	0.7%	0.6%

US Bureau of the Census, Population Division, Table 1-C. Projections of the Po
Net International Migration Series (NP2009-T1-C), December 2009
Washington State, Office of Financial Management, Population Trends for Was

Socioeconomic characteristics 2009-2013

The US Bureau of the Census conducts the decadal census consisting of a detailed and comprehensive assessment of employment, housing, income, household, and other statistics every 10 years that is used to determine electoral districts, income sharing, and other federal measures. The decadal census is based on census tracts that are statistical boundaries for the collection of information that are organized and grouped into jurisdictional areas consisting of census designated places (CDP), and census community designations (CDD), as well as cities, counties, and states. Kingston is part of a larger census tract that extends from Indianola north along the shoreline to Hansville.

The US Bureau of the Census initiated the American Community Survey (ACS) to provide current information on an annual basis. The ACS is based on annual random statistical sampling of minor civil divisions that are collated over a multiple years span to provide an accurate projection of socioeconomic conditions and trends. The most current ACS survey includes the years 2009-2013. Kingston is located in the Kingston census designated place (CDP) composed generally of the developed area in and around Kingston proper, and the census community designation (CDD) roughly composed of Kingston south to Indianola and north to Hansville.

The following charts are drawn from a comparison of socioeconomic characteristics for the United States, Washington State, Puget Sound (King, Kitsap, Pierce, and Snohomish Counties, Kitsap County, Kingston CCD, and Kingston CDP.

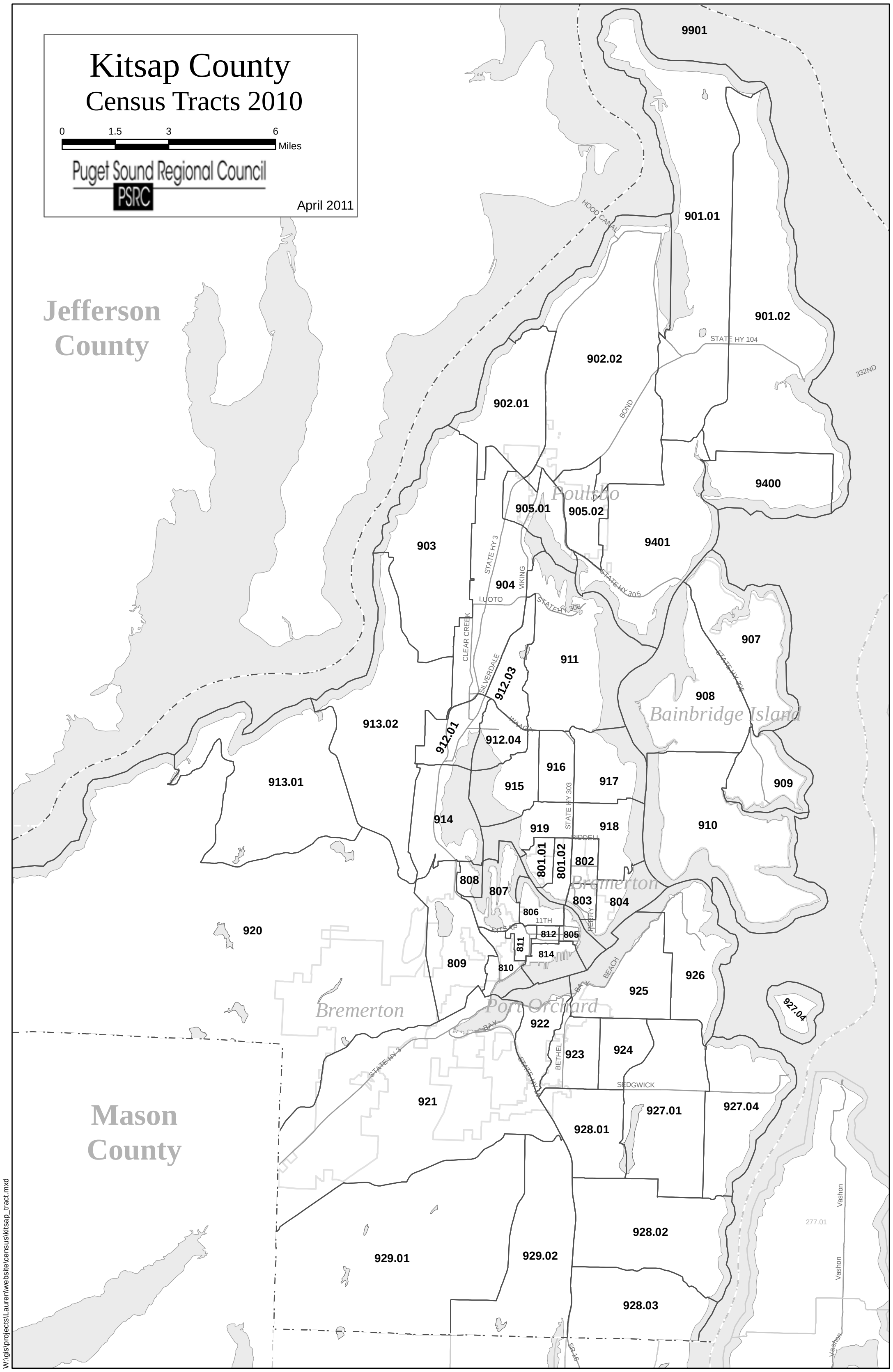
Comparisons
The comparisons shown in the charts indicate:

- **Age pyramid** – Kingston CDP is composed of more persons in older age groups than Kingston CCD, Kitsap County, Puget Sound, Washington State, or the US.
- **Household size** – is considerably smaller at 2.24 than all other areas.
- **Percent in families** – is lower at 55% than all other areas.
- **Median age** – at 44.9 is close to the CCD at 44.5 but older than all other areas.
- **Percent 65+** - is higher at 17% than all other areas.
- **Percent of all households in families** – is lower at 55% than all other areas.
- **Percent employed in civilian labor force** – is somewhat lower at 56% than all other areas but significantly higher than Kitsap County at 52% due to the concentration of military installations in the county.
- **Percent employed in base industries** (forestry, fisheries, agriculture, and manufacturing) – is lower at 12% than all other areas.
- **Percent employed in services** (retail and wholesale trade, transportation, communications, education, entertainment, and government) – is higher at 88% than all other areas.
- **Median house value** – is lower at $255,700 than the CCD at $299,300 but somewhat typical of Washington State except for the urban Puget Sound at $324,111.
- **Median rent** – is lower at $951 than the CCD at $1,080, Kitsap County at $1,035, and Puget Sound at $1,094.
- **Percent in detached single-family units** – is lower at 61% than the CCD at 86% but somewhat typical of all other areas.
- **Mean travel time to work in minutes** – at 36.7 minutes in lower than the CCD at 41.3 minutes but higher than all other areas.
- **Resided in same house 1 year ago** – at 93% is higher than the CCD at 90% and considerably higher than all other areas.
- **Percent owner occupied** – at 69% is lower than the CCD at 81% but only slightly higher than all other areas.
- **Percent renter occupied units** – at 31% is higher than the CCD at 19% but lower than all other areas.
- **Median family income** – at $66,250 is lower than all other areas in Washington State but higher than the US.
- **Median per capita income** – at $30,307 is similar to the CCD and Kitsap County but lower than Puget Sound at $35,207.

- **Percent in multifamily units of 20+ units** – at 4% is higher than the CCD at 1% and lower than Kitsap County at 5% but substantially lower than all other areas.
- **Workers of private wages and salary** – at 62% is typical of the CCD at 61% but lower than all other areas.
- **Workers government** – at 18% is lower than the CCD at 26% and Kitsap County at 27% but higher than all other areas.
- **Workers self employed** – at 19% is higher than the CCD at 13% and considerably higher than all other areas.
- **Percent with no vehicles available** – at 1% is considerably below all other areas.
- **Hispanic or Latino of any race** – at 4% is lower than the CCD at 5% and considerably below all other areas.
- **Language other than English** – at 6% is the same as the CCD but lower than Kitsap County at 9% and considerably below all other areas.
- **Percent of population in poverty** – at 4.0% is considerably lower than all other areas.
- **Total families in poverty** – at 2.9% is lower than the CCD at 3.4% and considerably lower than all other areas.
- **Commute to work** – at 78% by car, truck, or van driving alone and worked at home at 13% is considerably higher than all other areas.

Summary

In short, the Kingston CDP has accumulated an older and aging population in nonfamily and empty-nester households, in service industry employments, with lower house values and rents, with lower family and per capita incomes, in more multifamily housing units, with self employment, working at home that are primarily Caucasian, English speaking.



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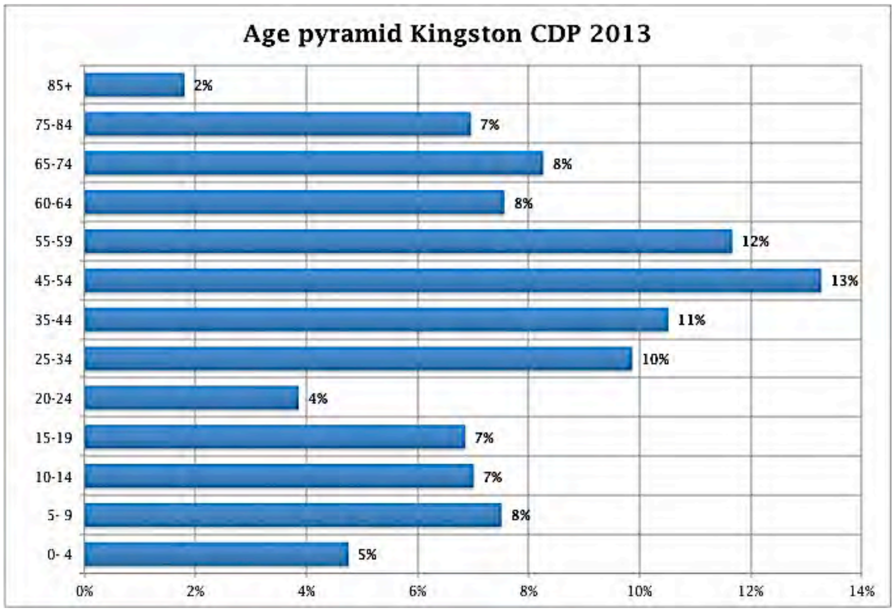
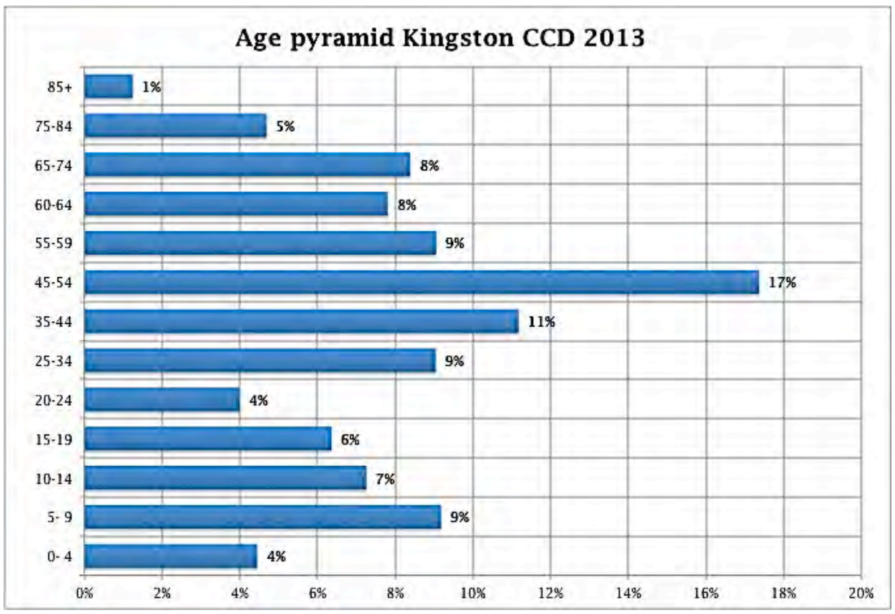
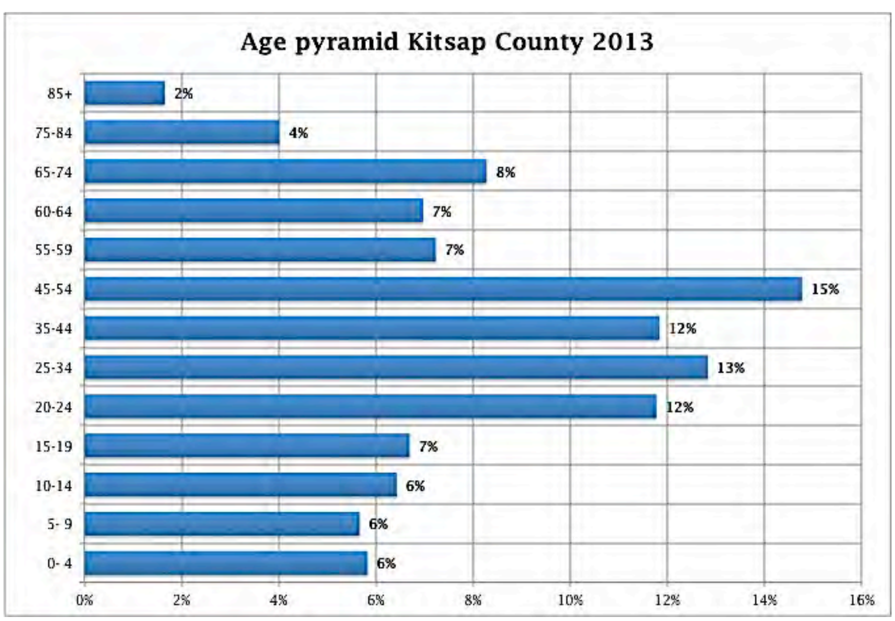
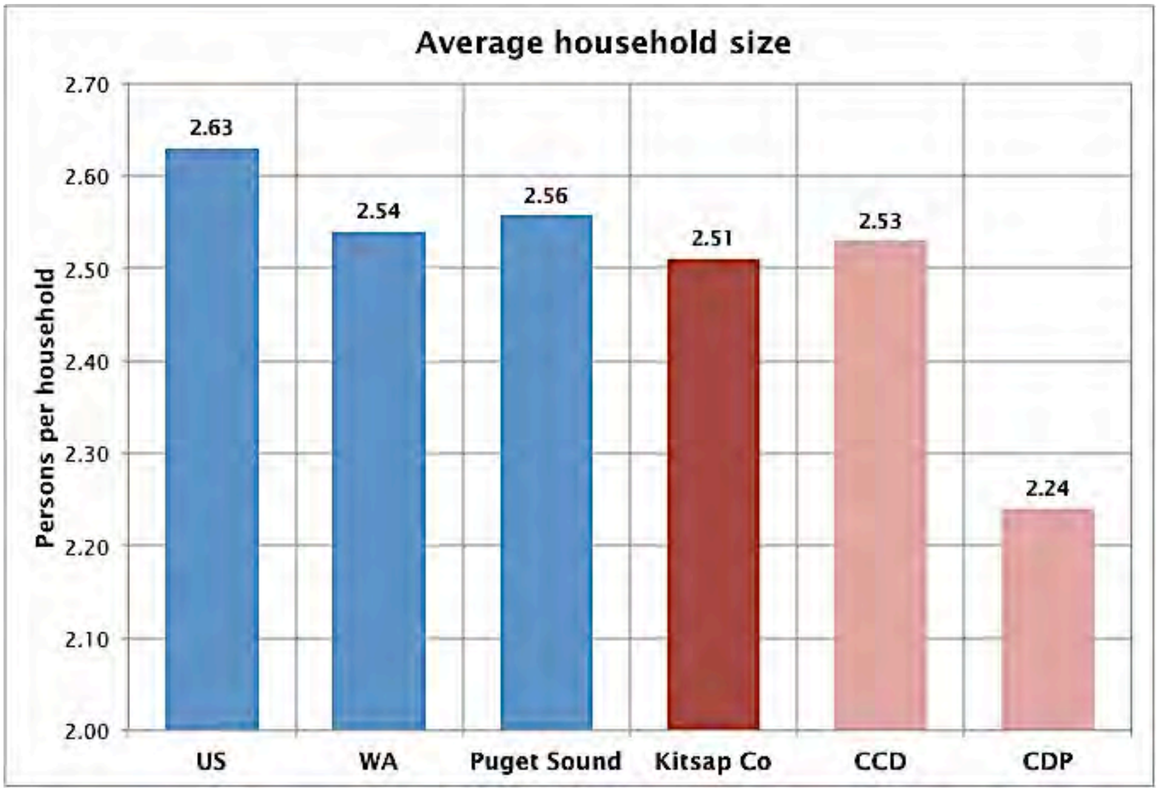
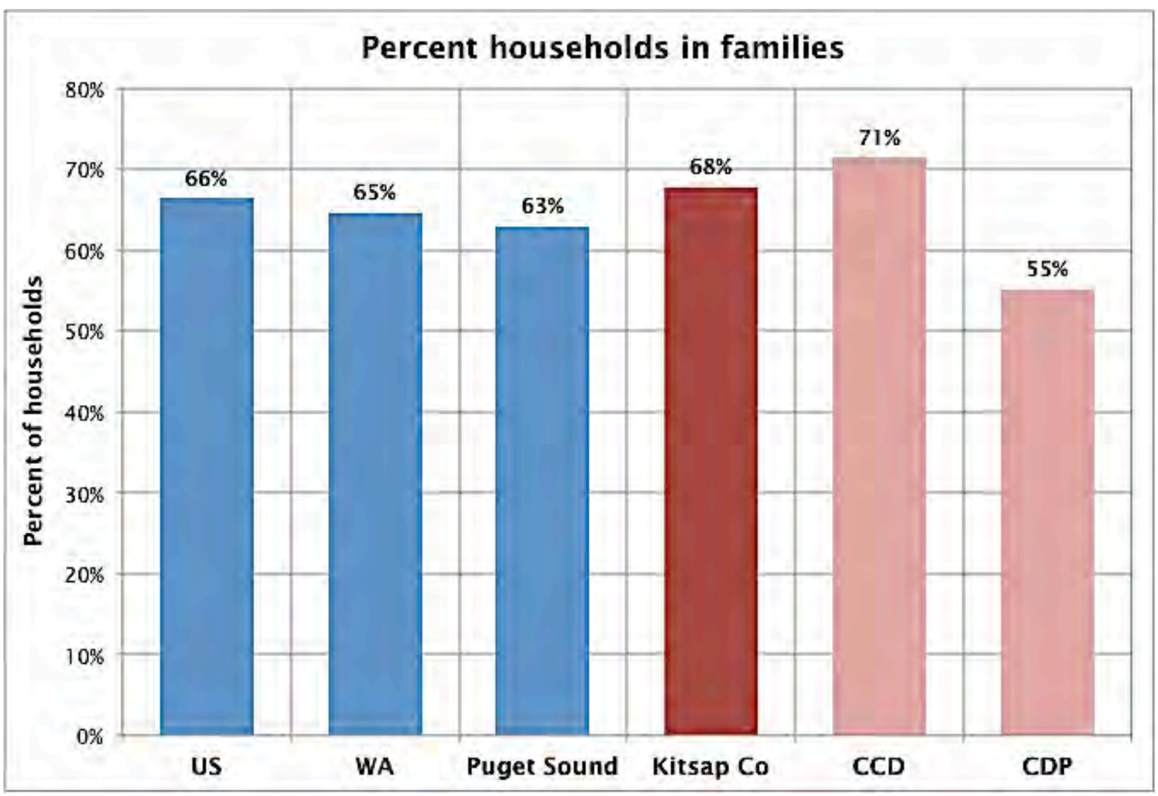
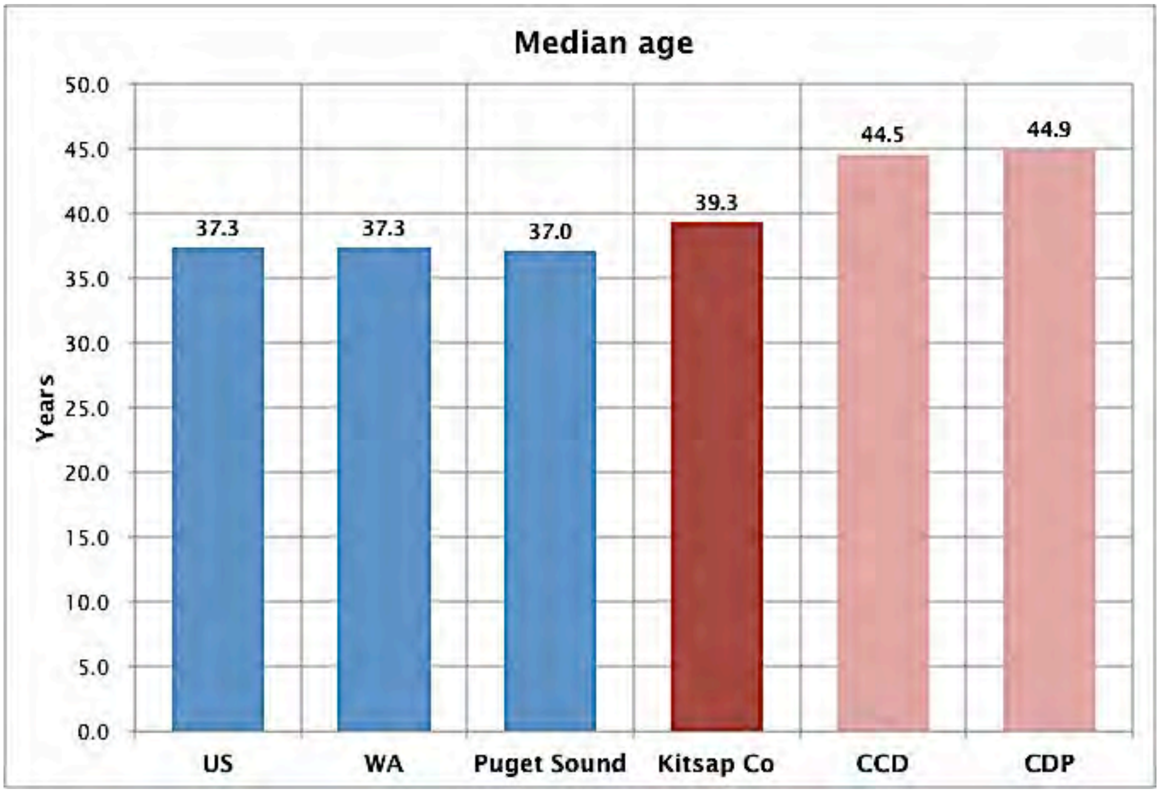

Age pyramid Kingston CDP 2013
85+
75-84
65-74
60-64
55-59
45-54
35-44
25-34
20-24
15-19
10-14
5- 9
0- 4
2%
7%
8%
8%
12%
13%
11%
10%
4%
7%
7%
8%
5%
0%
2%
4%
6%
8%
10%
12%
14%

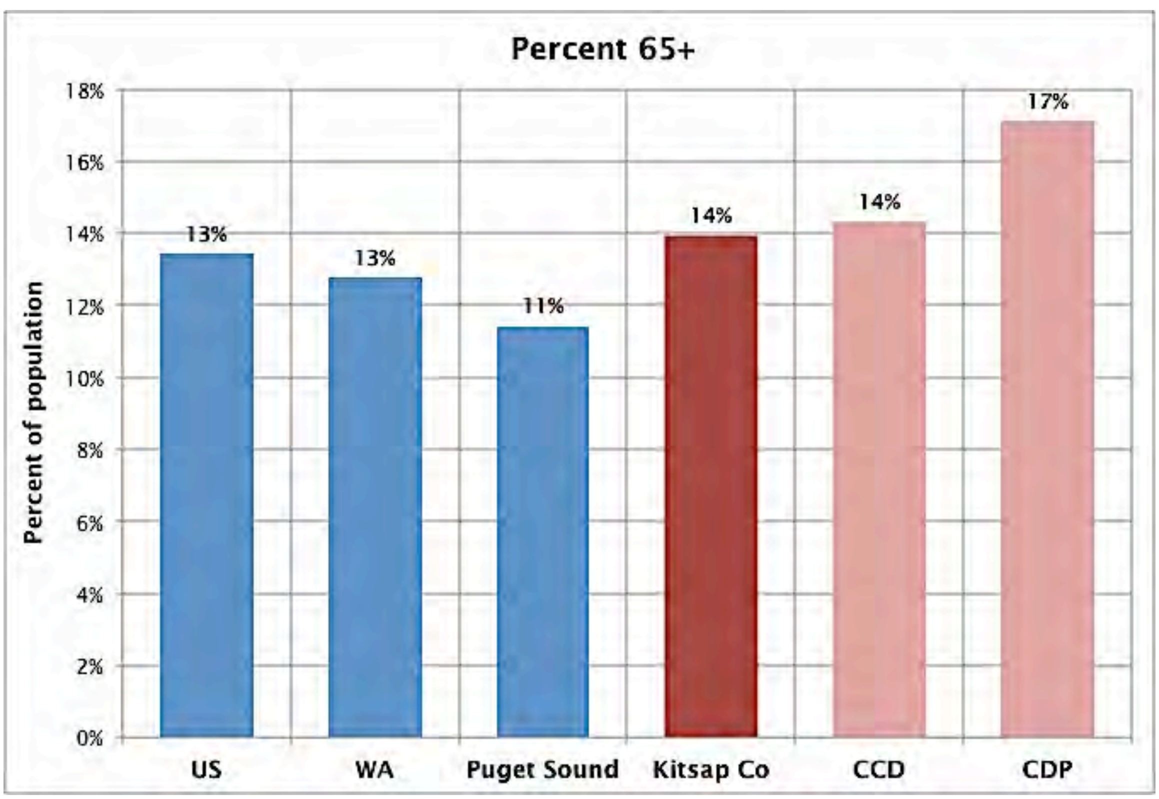

Age pyramid Kingston CCD 2013
85+
75-84
65-74
60-64
55-59
45-54
35-44
25-34
20-24
15-19
10-14
5- 9
0- 4
1%
5%
8%
8%
9%
17%
11%
9%
4%
6%
7%
9%
4%
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%

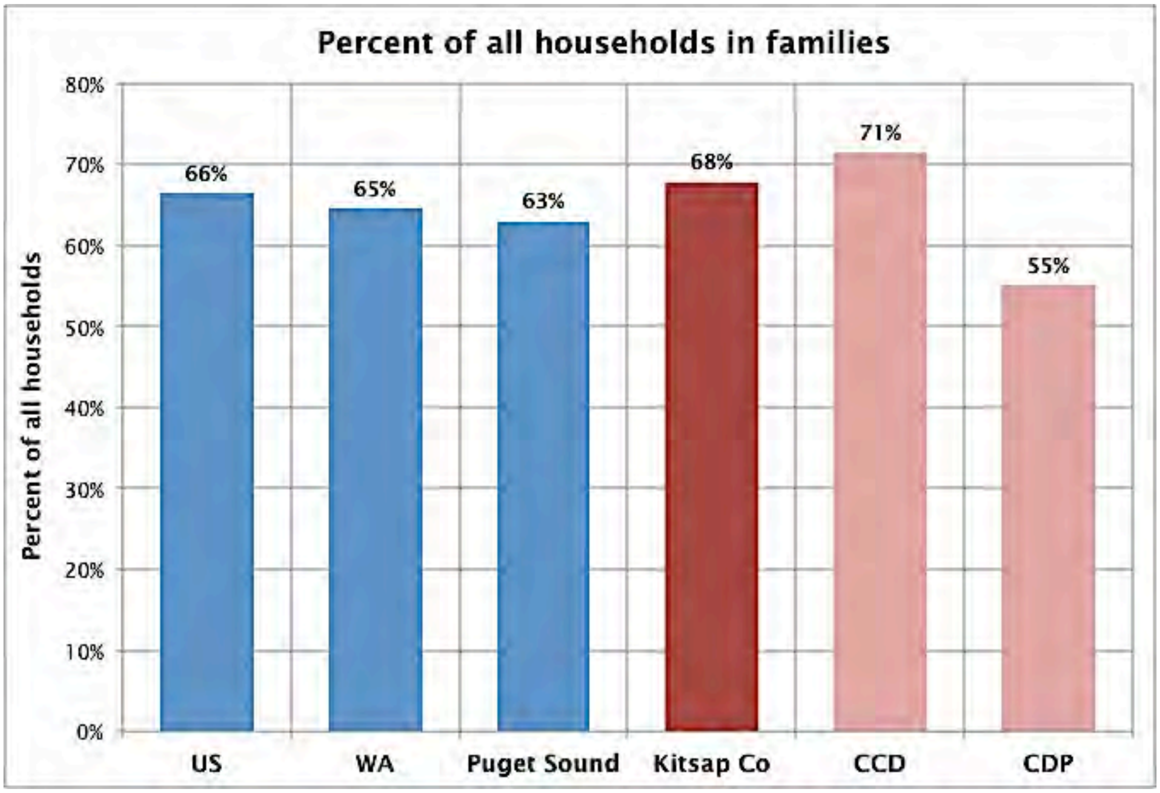

Age pyramid Kitsap County 2013
85+
75-84
65-74
60-64
55-59
45-54
35-44
25-34
20-24
15-19
10-14
5- 9
0- 4
2%
4%
8%
7%
7%
15%
12%
13%
12%
7%
6%
6%
6%
0%
2%
4%
6%
8%
10%
12%
14%
16%

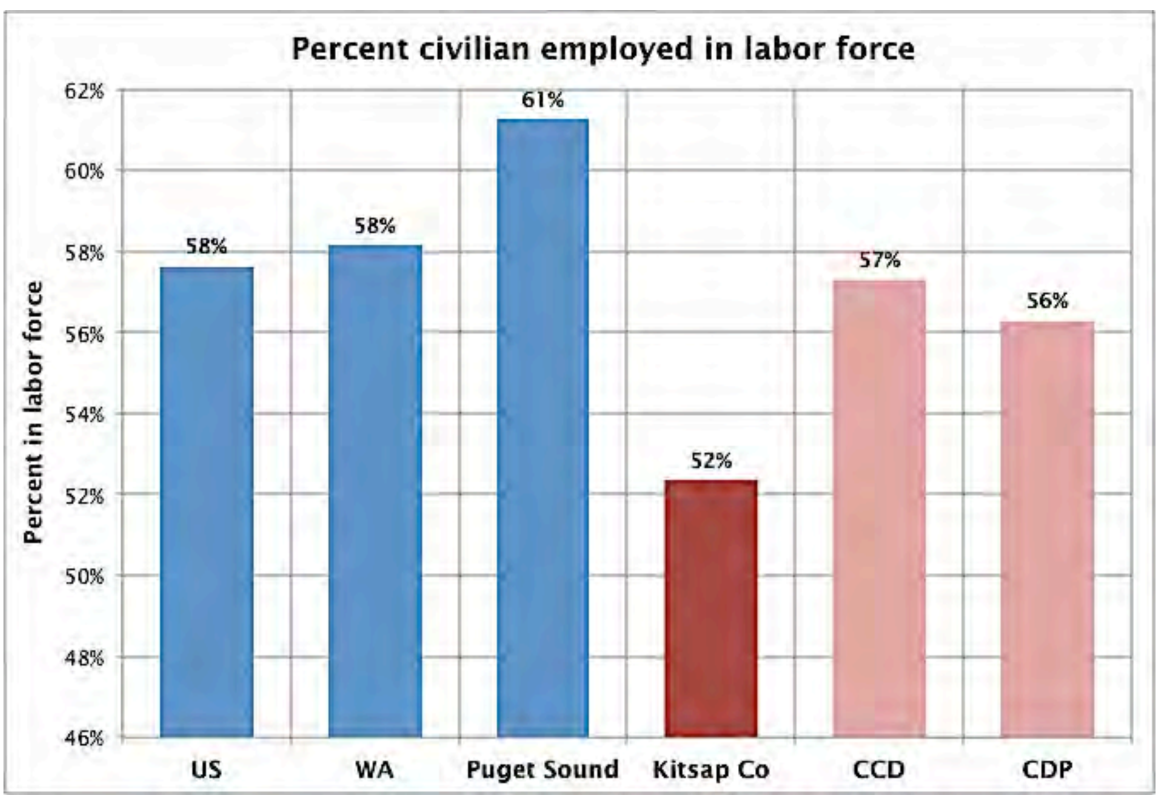

Average household size
Persons per household
2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
2.63
2.54
2.56
2.51
2.53
2.24
US
WA
Puget Sound
Kitsap Co
CCD
CDP

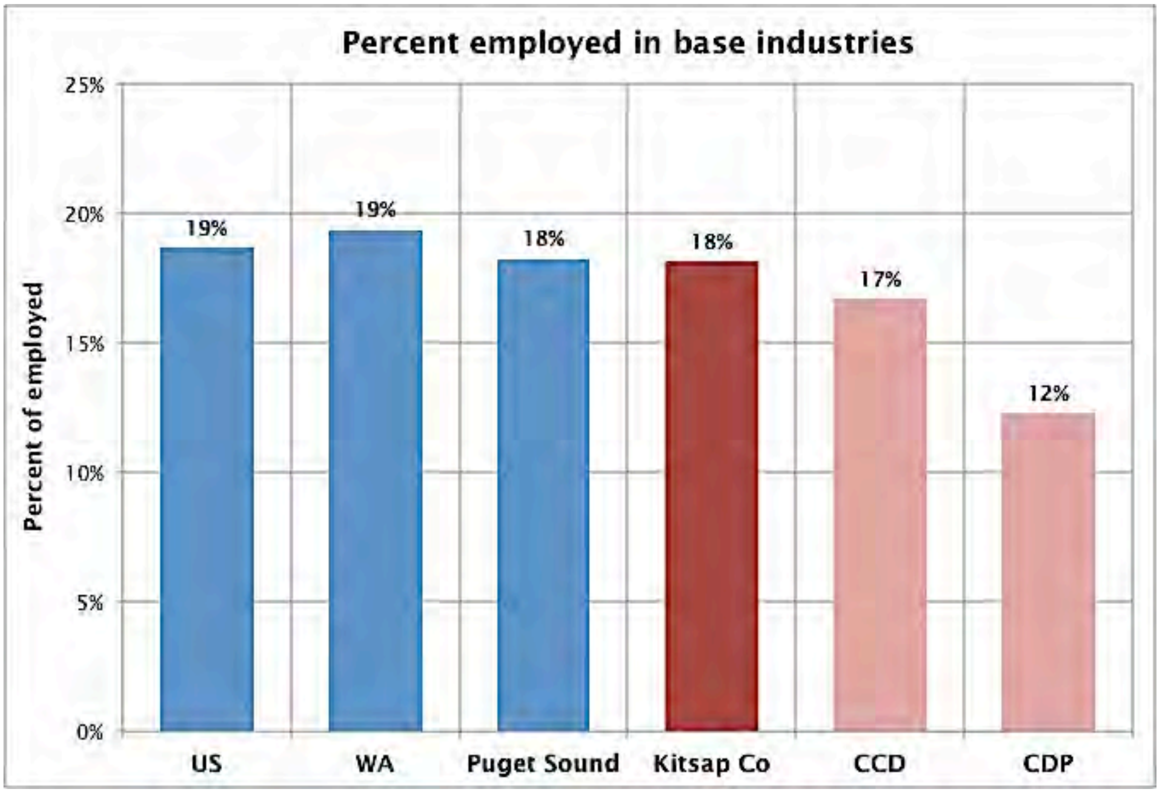

Percent households in families
Percent of households
80%
70%
60%
50%
40%
30%
20%
10%
0%
66%
65%
63%
68%
71%
55%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

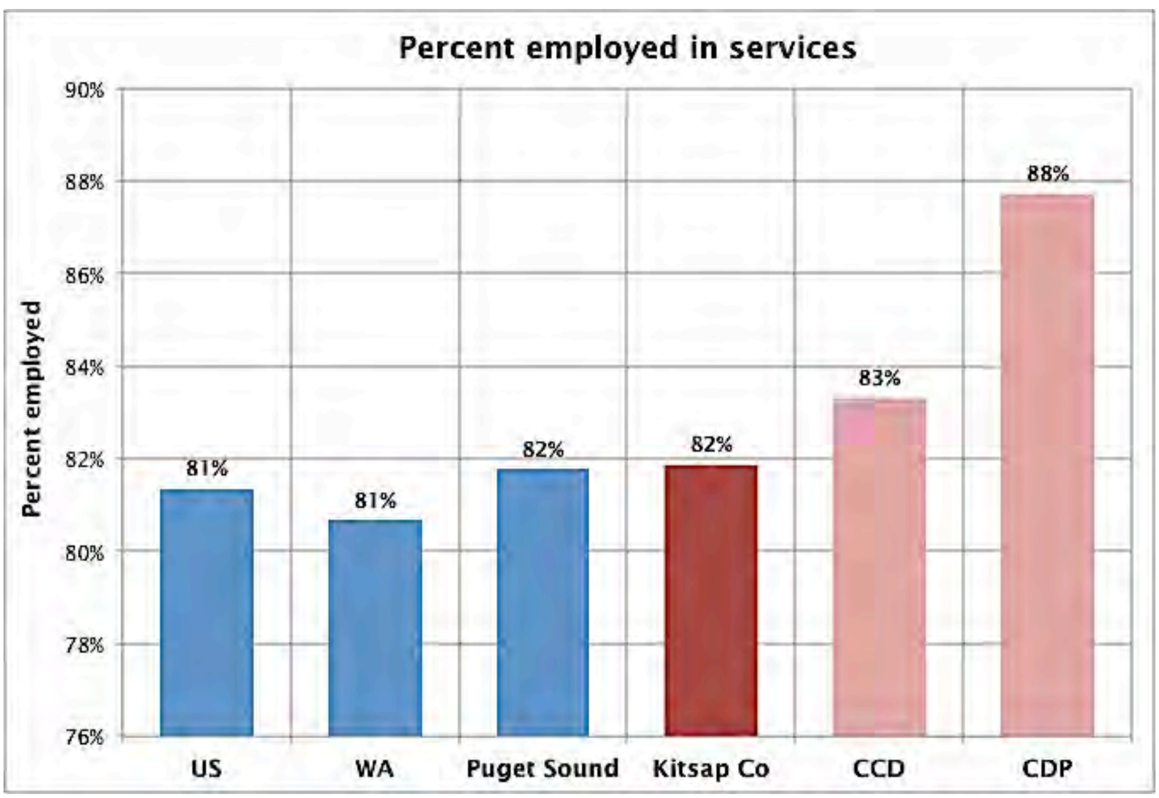

Median age
Years
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
37.3
37.3
37.0
39.3
44.5
44.9
US
WA
Puget Sound
Kitsap Co
CCD
CDP

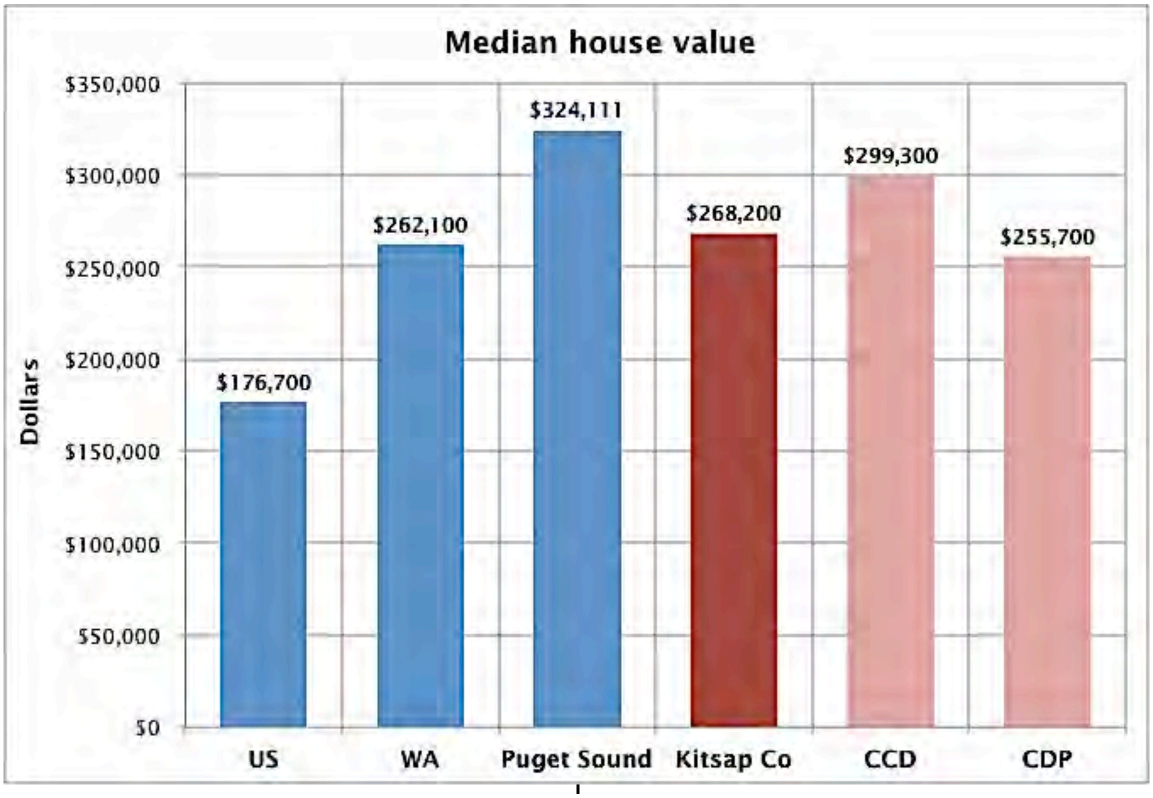

Percent 65+
Percent of population
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
13%
13%
11%
14%
14%
17%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

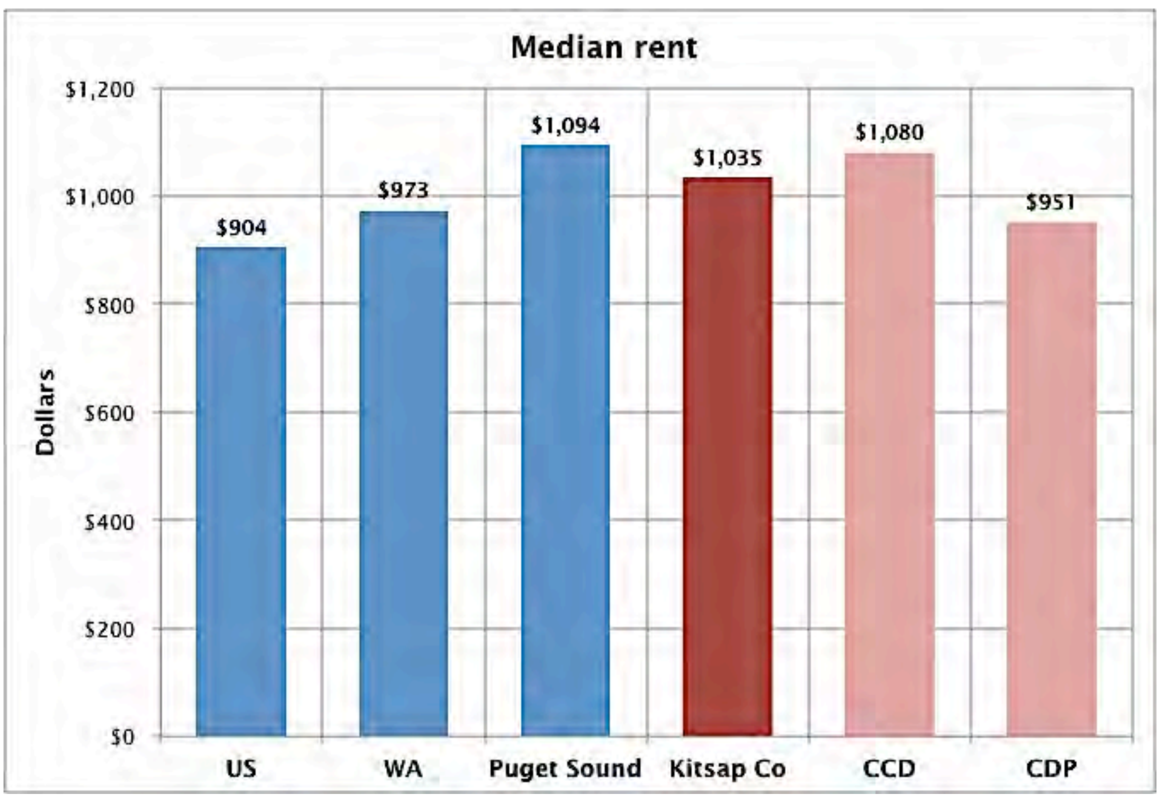

Percent of all households in families
Percent of all households
80%
70%
60%
50%
40%
30%
20%
10%
0%
66%
65%
63%
68%
71%
55%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

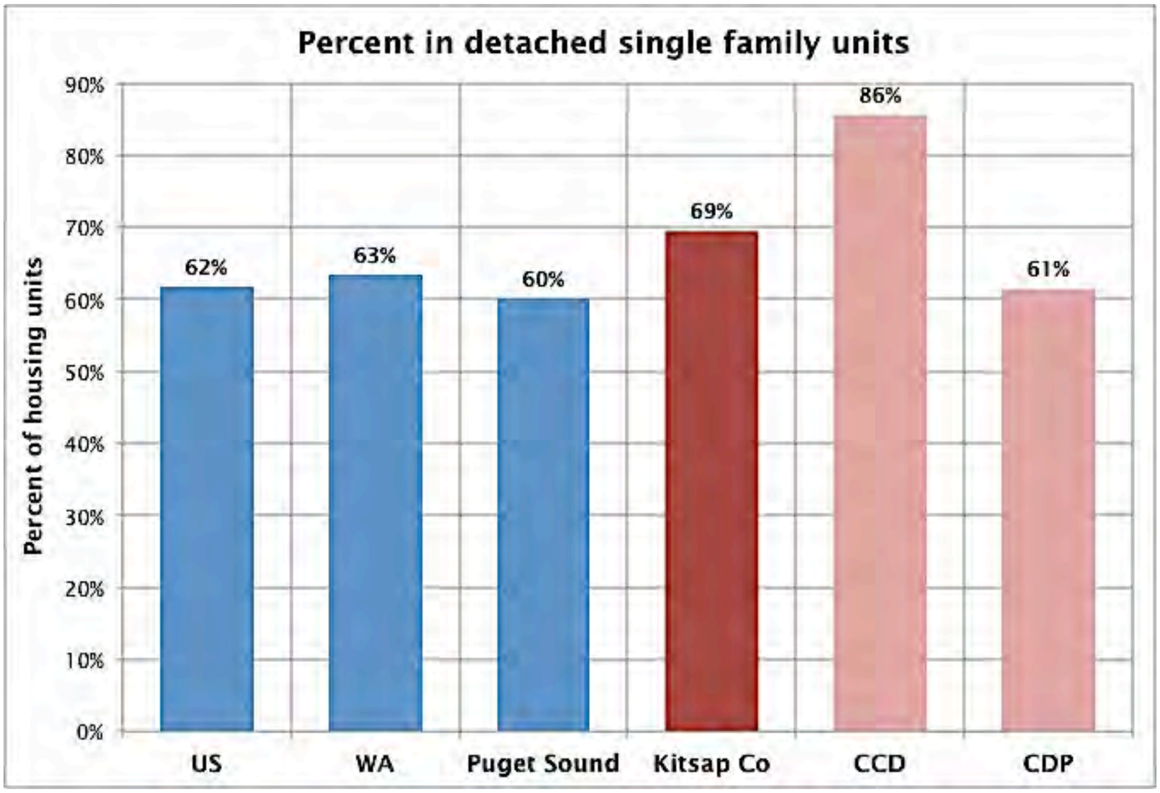

Percent civilian employed in labor force
Percent in labor force
62%
60%
58%
56%
54%
52%
50%
48%
46%
58%
58%
61%
52%
57%
56%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

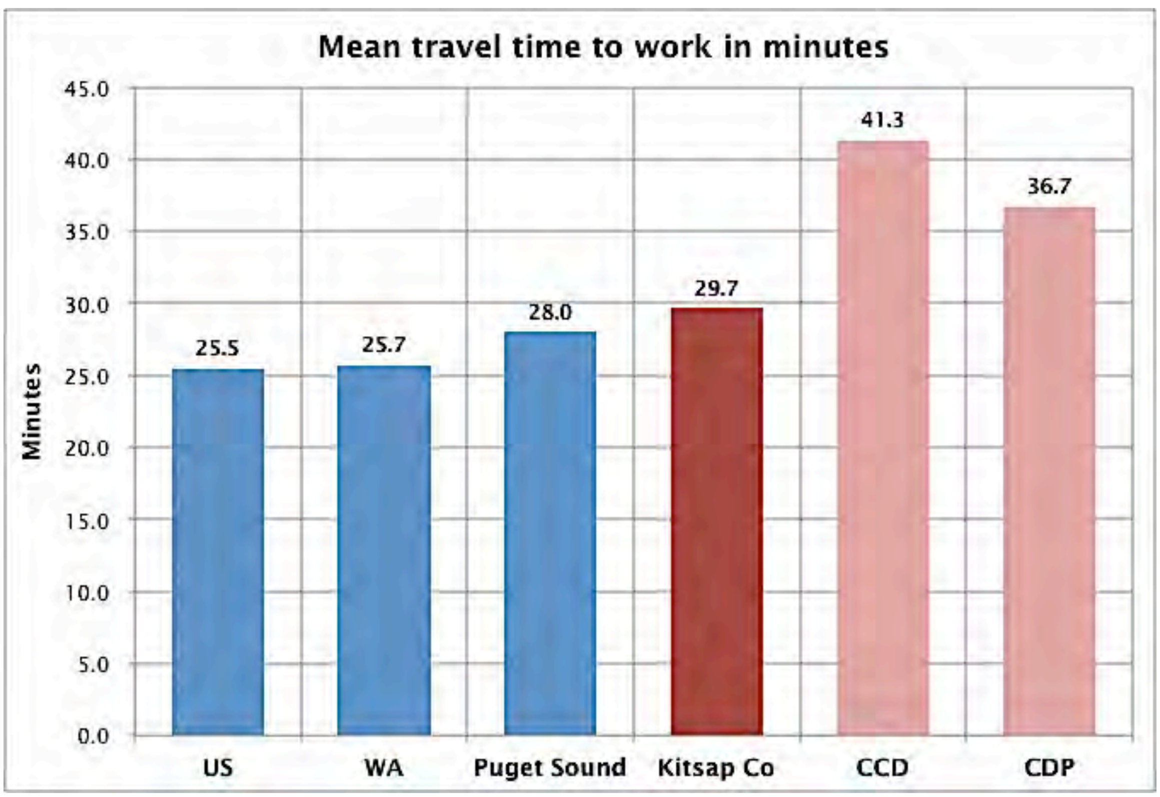

Percent employed in base industries
25%
20%
15%
10%
5%
0%
Percent of employed
19%
19%
18%
18%
17%
12%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

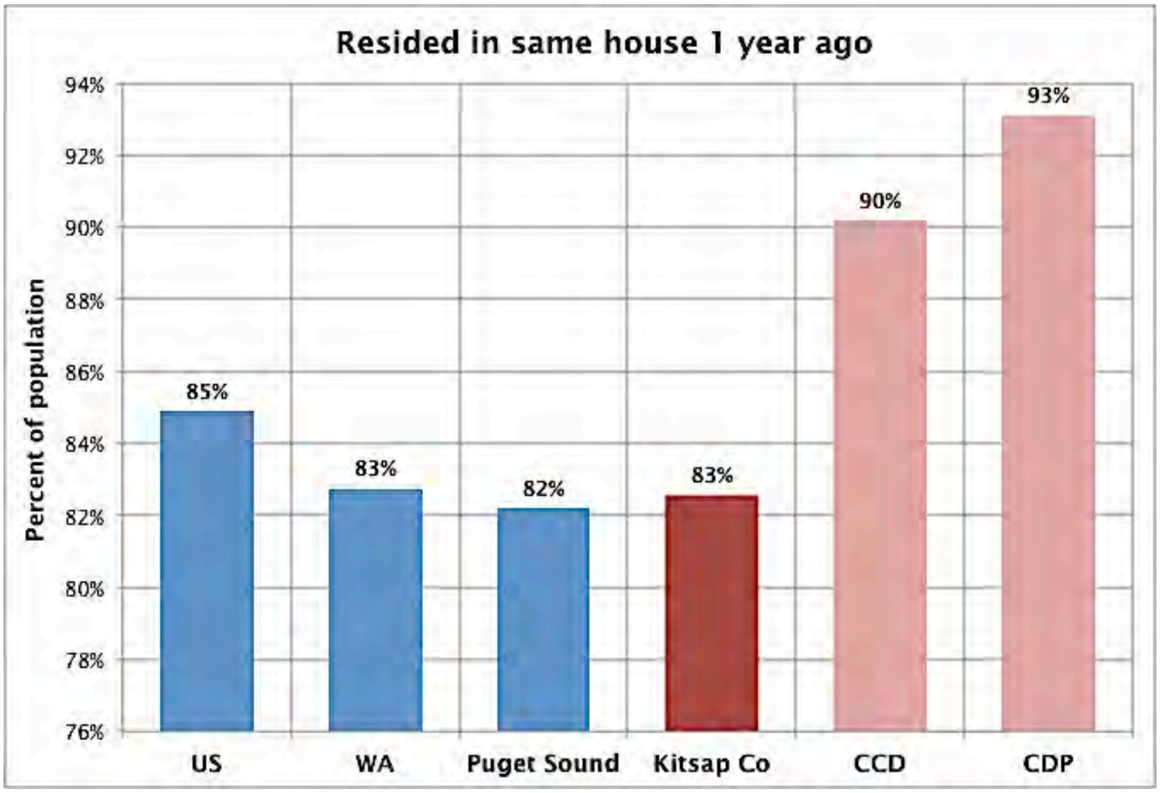

Percent employed in services
90%
88%
86%
84%
82%
80%
78%
76%
Percent employed
81%
81%
82%
82%
83%
88%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

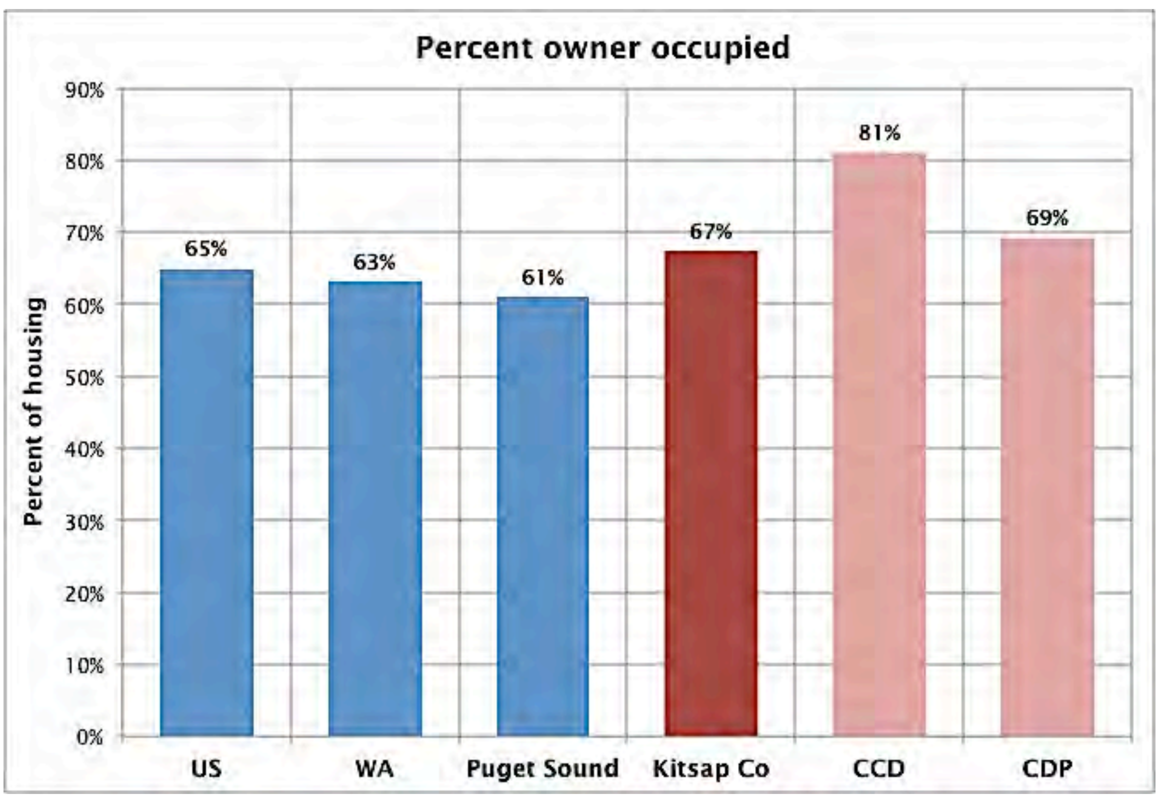

Median house value
Dollars
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
$176,700
$262,100
$324,111
$268,200
$299,300
$255,700
US
WA
Puget Sound
Kitsap Co
CCD
CDP

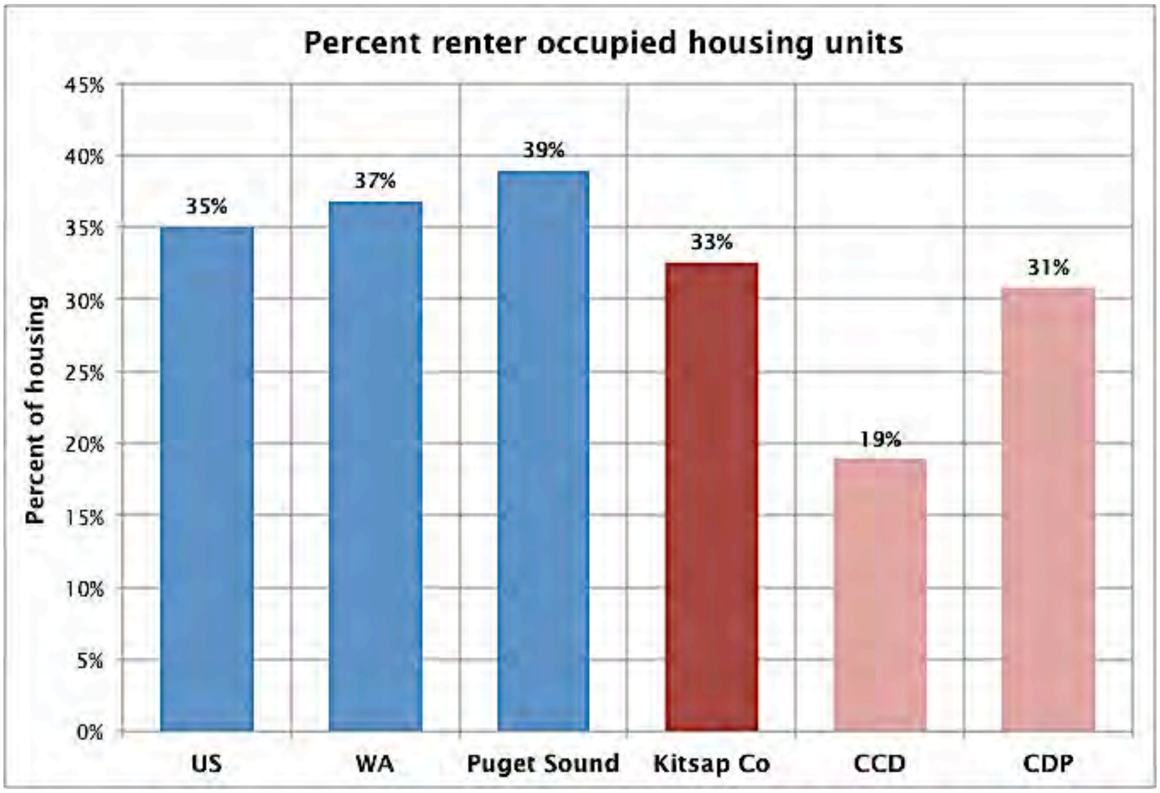

Median rent
Dollars
$1,200
$1,000
$800
$600
$400
$200
$0
$904
$973
$1,094
$1,035
$1,080
$951
US
WA
Puget Sound
Kitsap Co
CCD
CDP

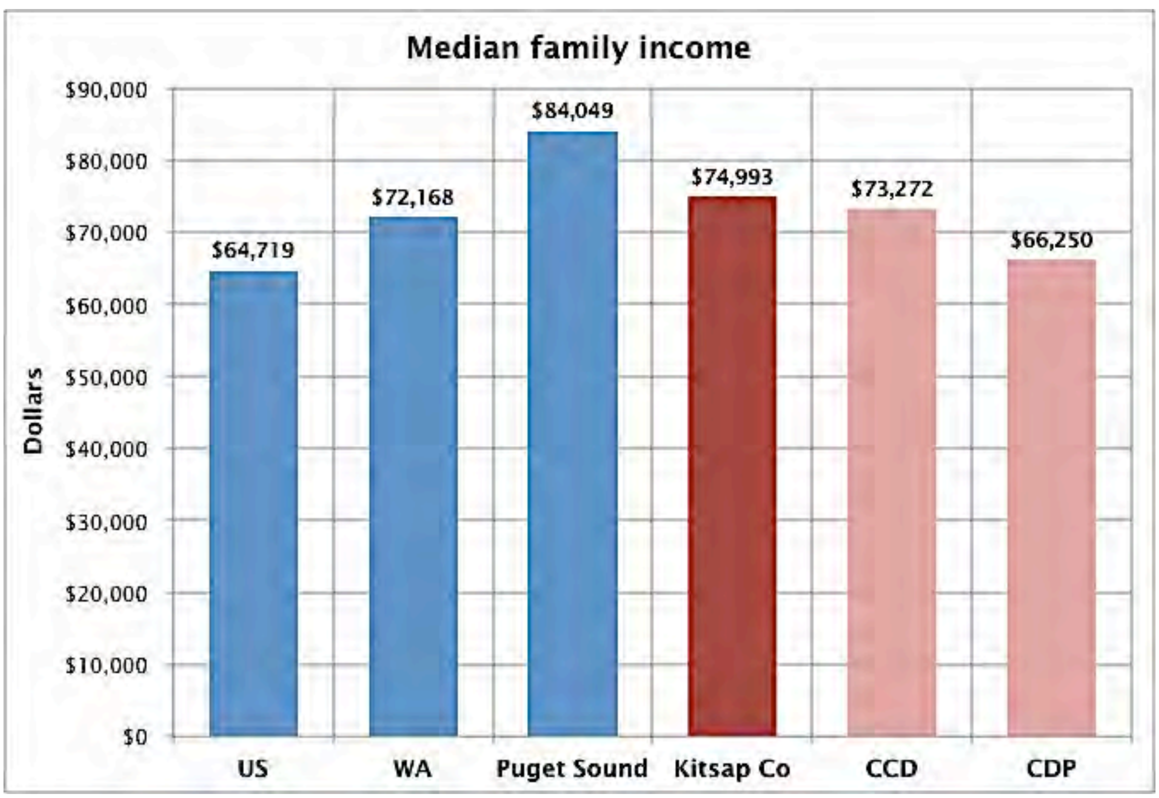

Percent in detached single family units
Percent of housing units
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
62%
63%
60%
69%
86%
61%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

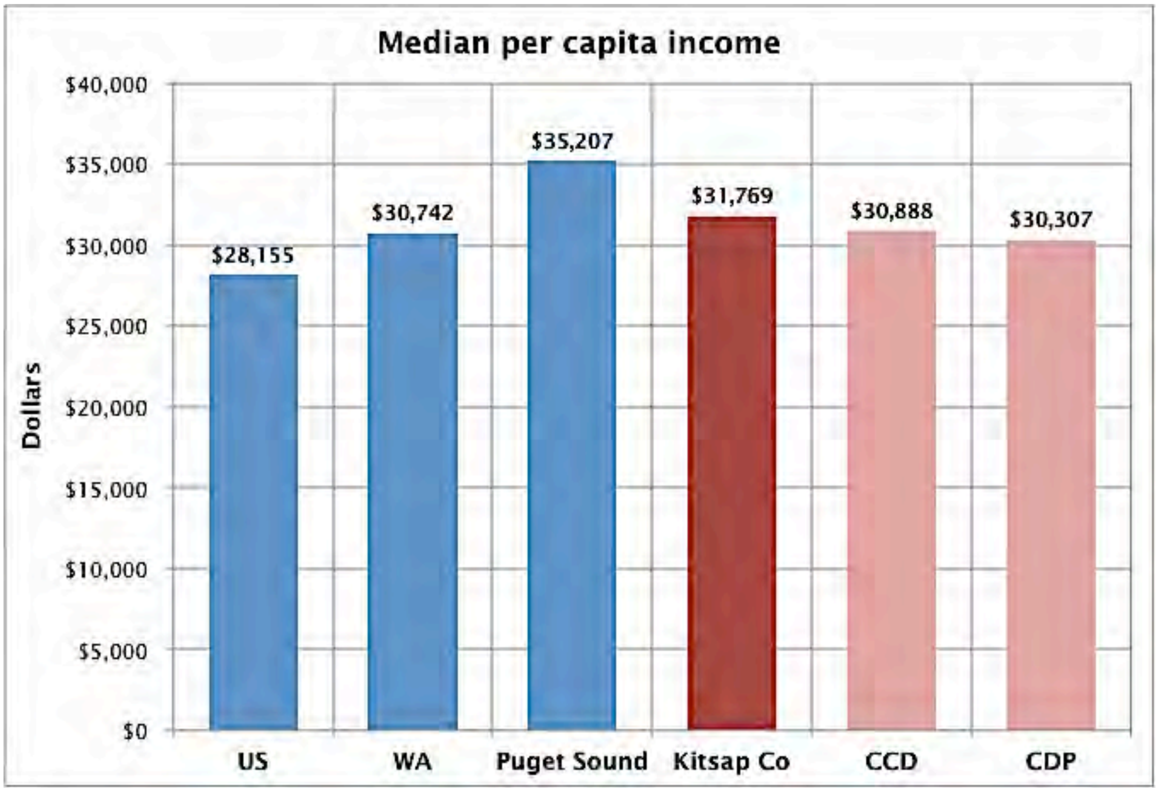

Mean travel time to work in minutes
Minutes
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
25.5
25.7
28.0
29.7
41.3
36.7
US
WA
Puget Sound
Kitsap Co
CCD
CDP

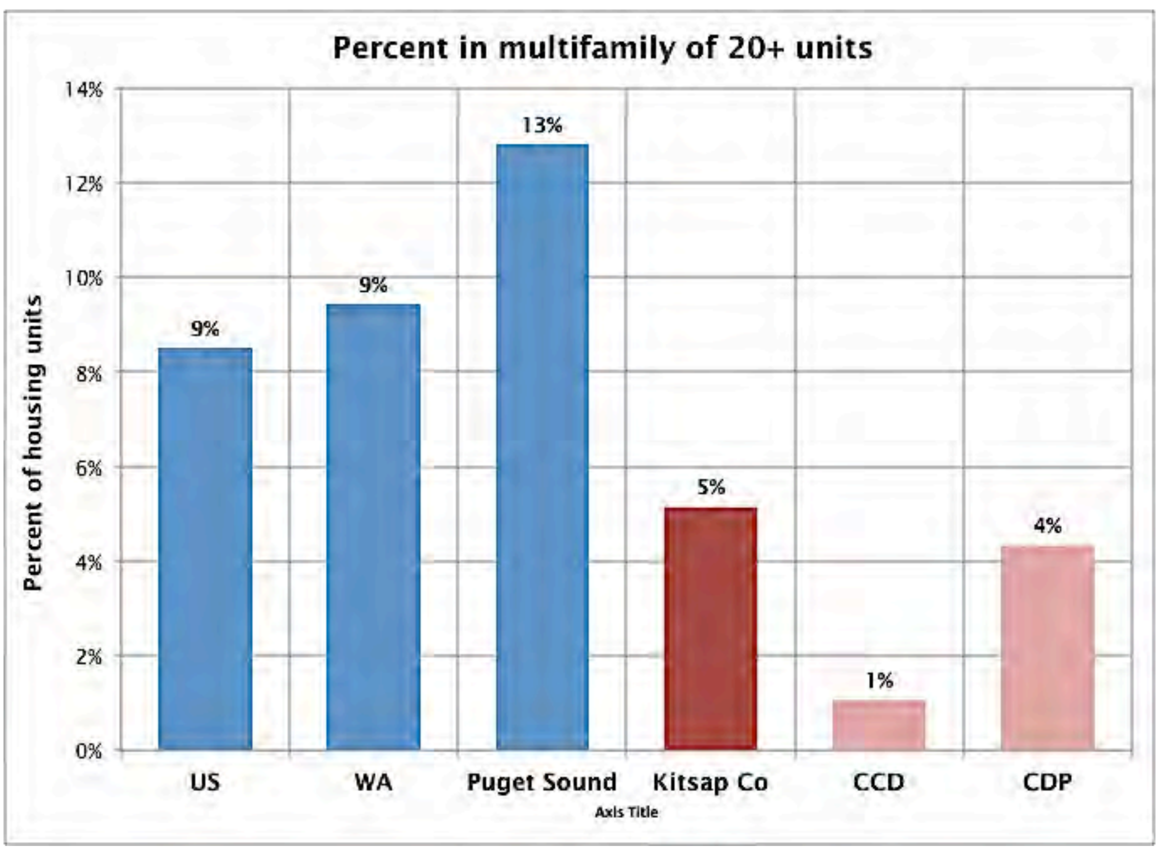

Resided in same house 1 year ago
Percent of population
94%
92%
90%
88%
86%
84%
82%
80%
78%
76%
85%
83%
82%
83%
90%
93%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

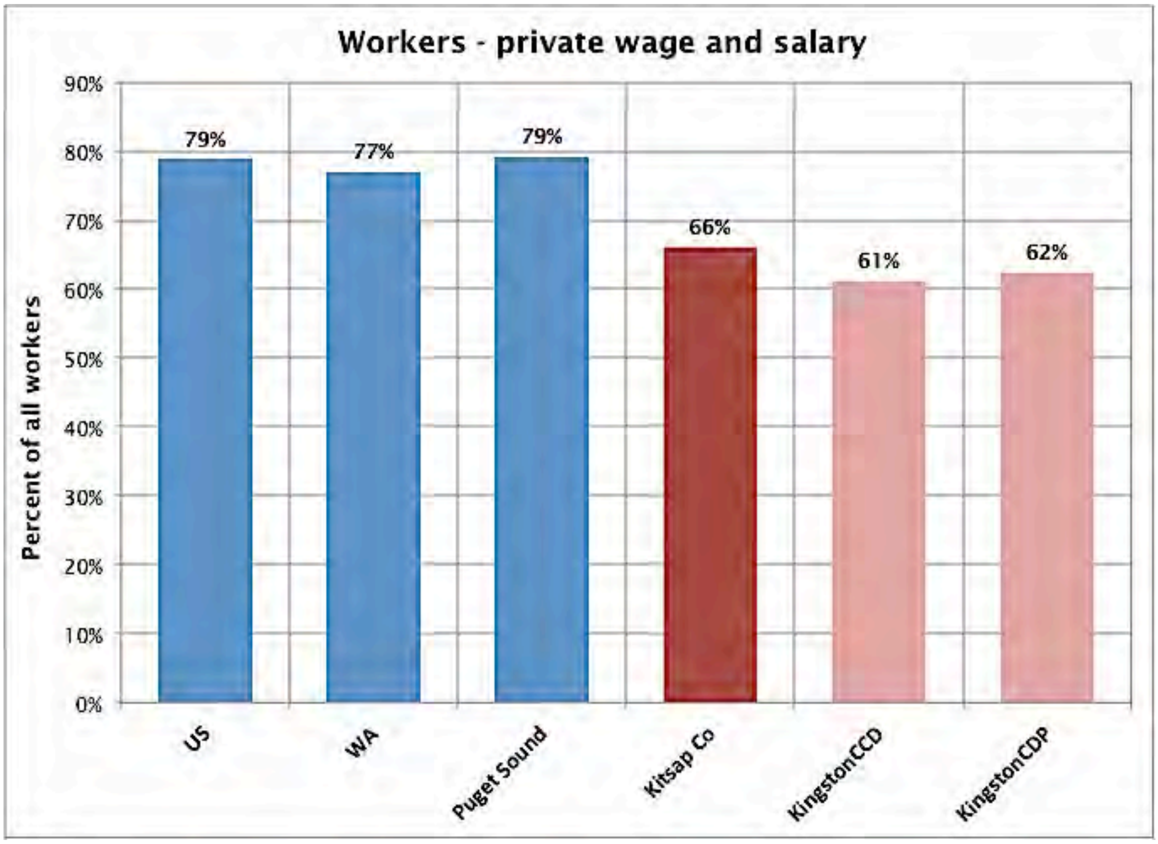

Percent owner occupied
Percent of housing
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
65%
63%
61%
67%
81%
69%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

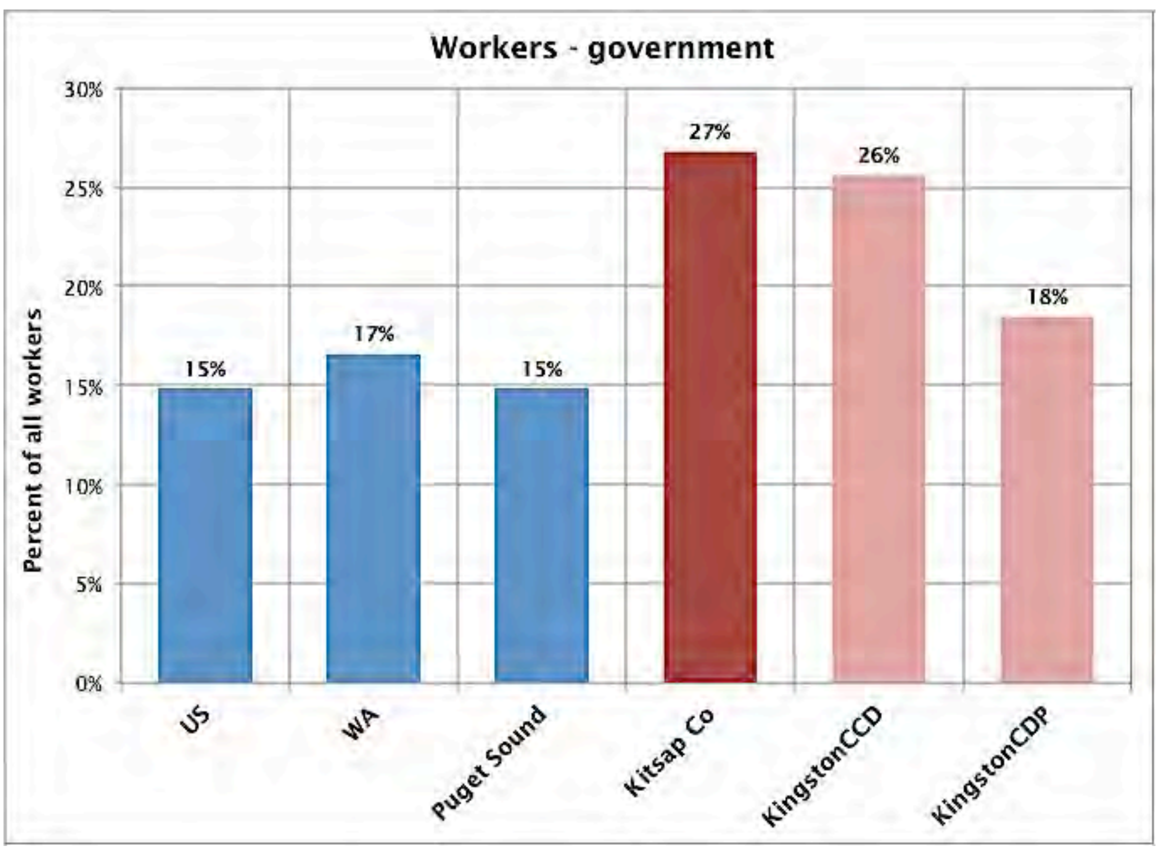

Percent renter occupied housing units
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Percent of housing
35%
37%
39%
33%
19%
31%
US
WA
Puget Sound
Kitsap Co
CCD
CDP

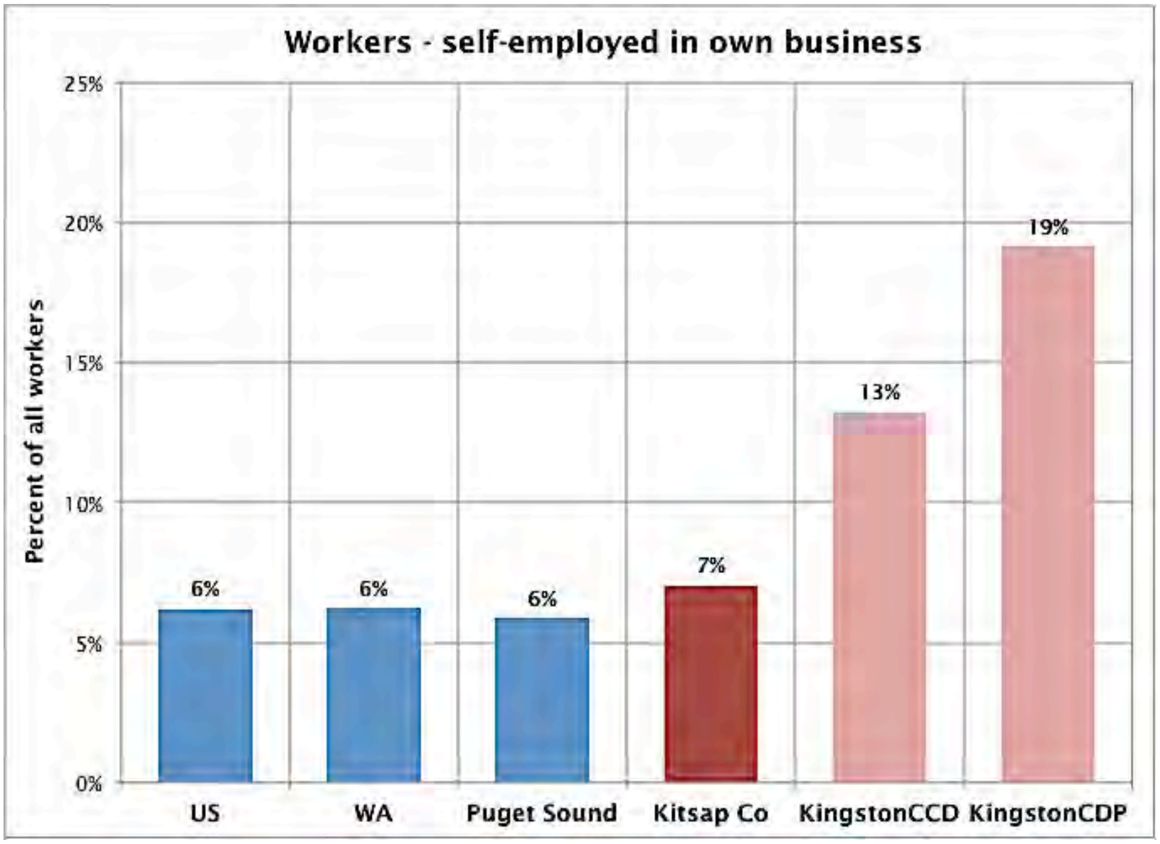

Median family income
$90,000
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Dollars
$64,719
$72,168
$84,049
$74,993
$73,272
$66,250
US
WA
Puget Sound
Kitsap Co
CCD
CDP

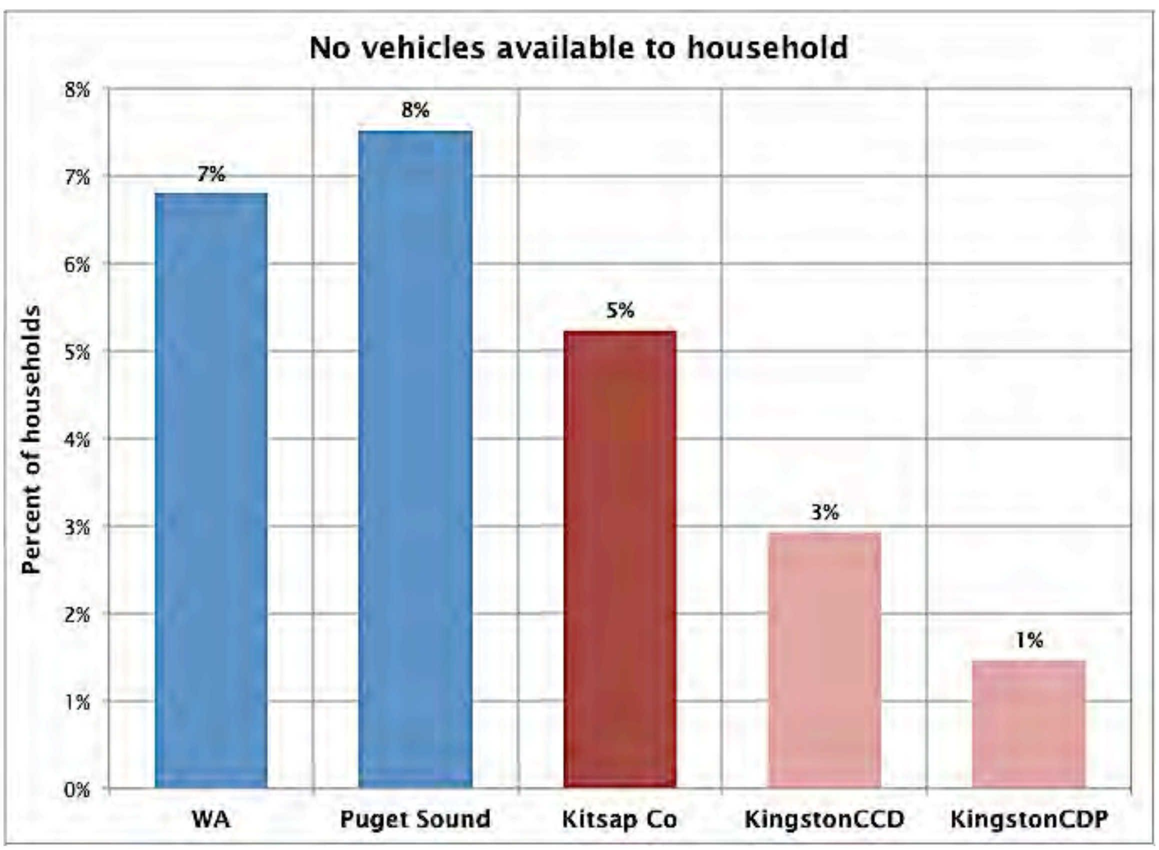

Median per capita income
Dollars
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
$28,155
$30,742
$35,207
$31,769
$30,888
$30,307
US
WA
Puget Sound
Kitsap Co
CCD
CDP

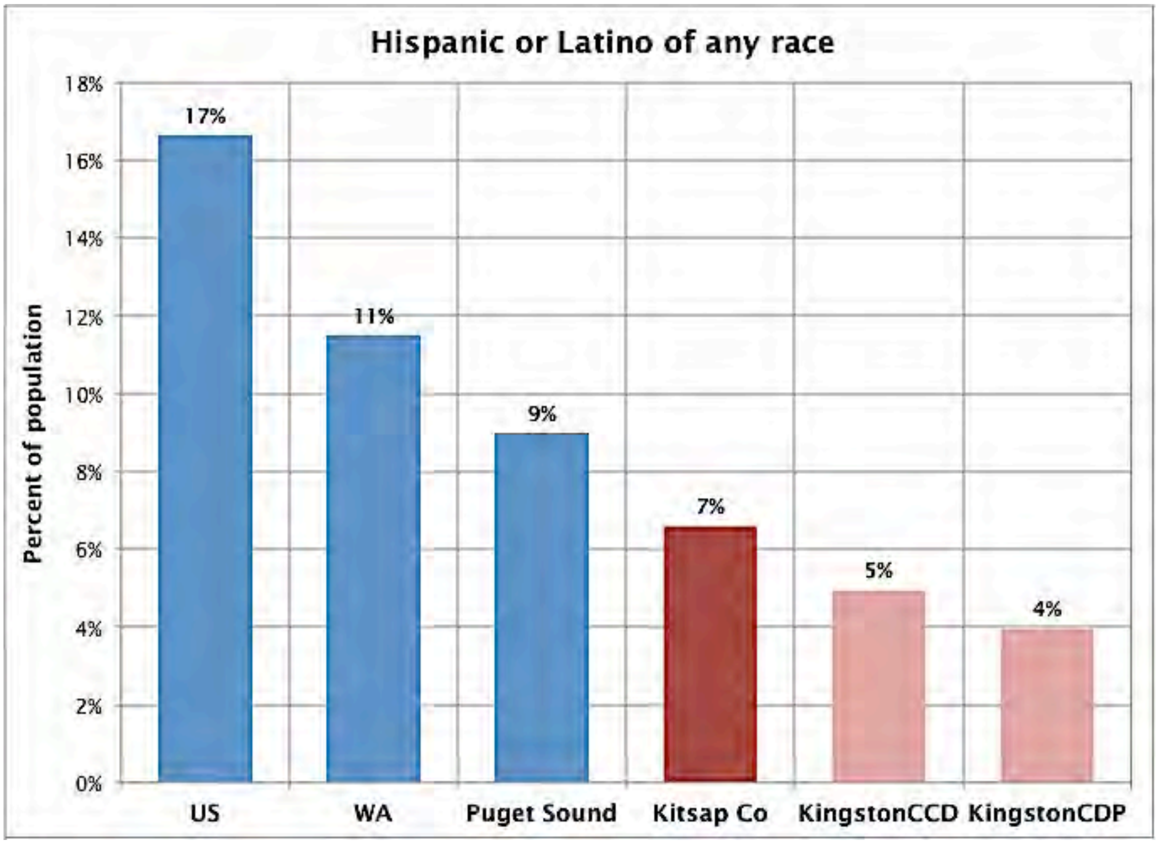

Percent in multifamily of 20+ units
Percent of housing units
14%
12%
10%
8%
6%
4%
2%
0%
9%
9%
13%
5%
1%
4%
US
WA
Puget Sound
Kitsap Co
CCD
CDP
Axis Title

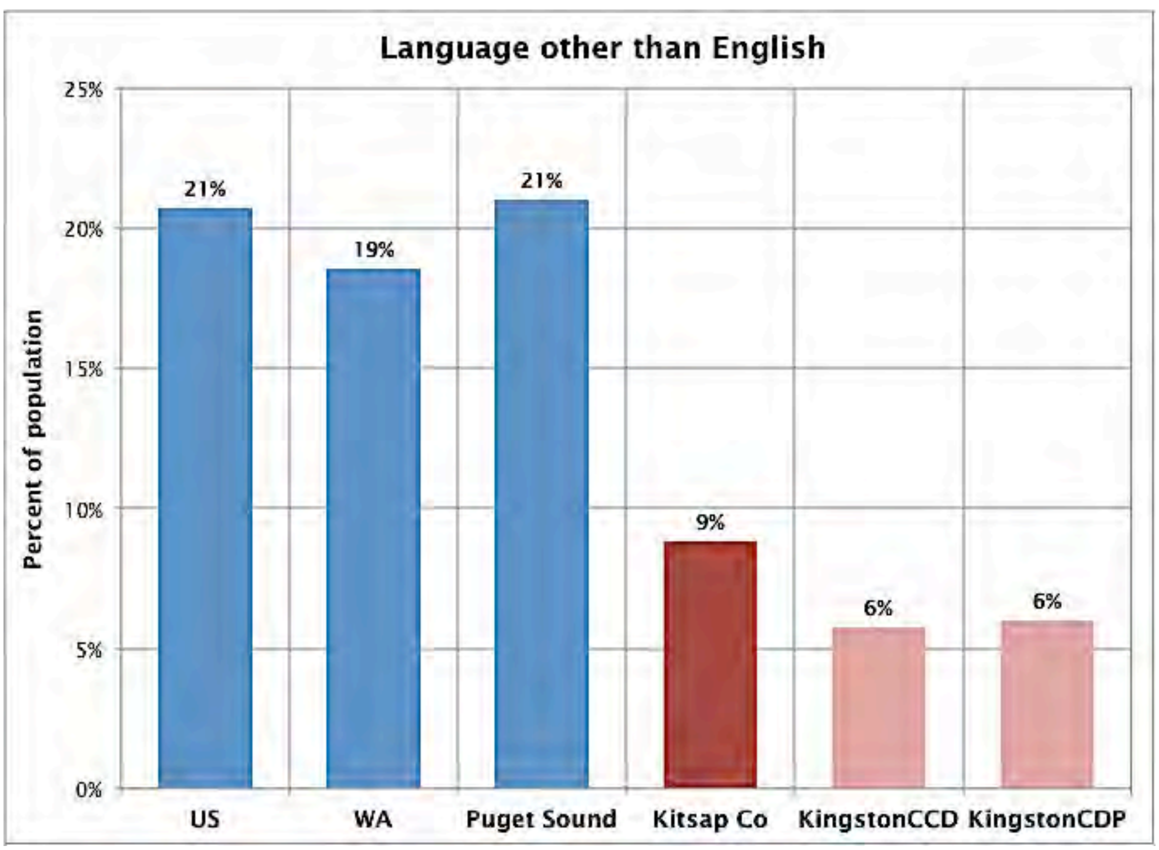

Workers - private wage and salary
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of all workers
79%
77%
79%
66%
61%
62%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP

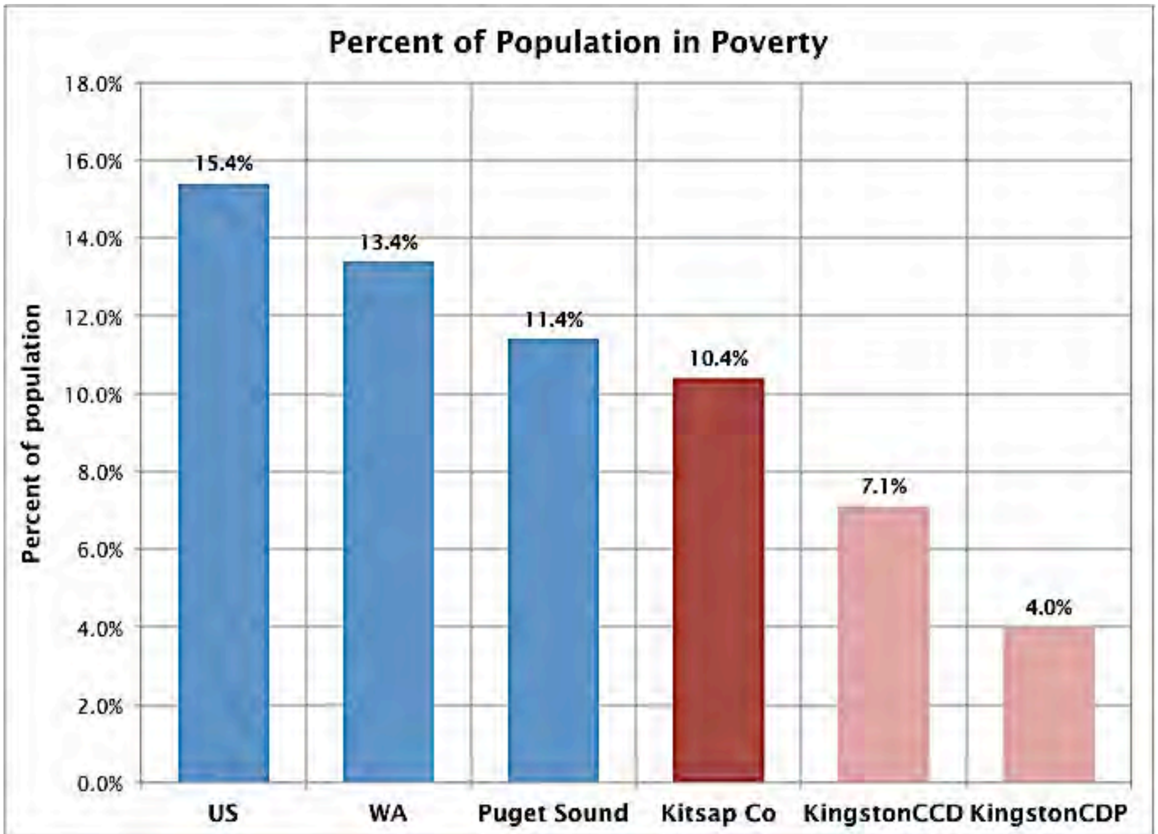

Workers - government
30%
25%
20%
15%
10%
5%
0%
Percent of all workers
15%
17%
15%
27%
26%
18%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP

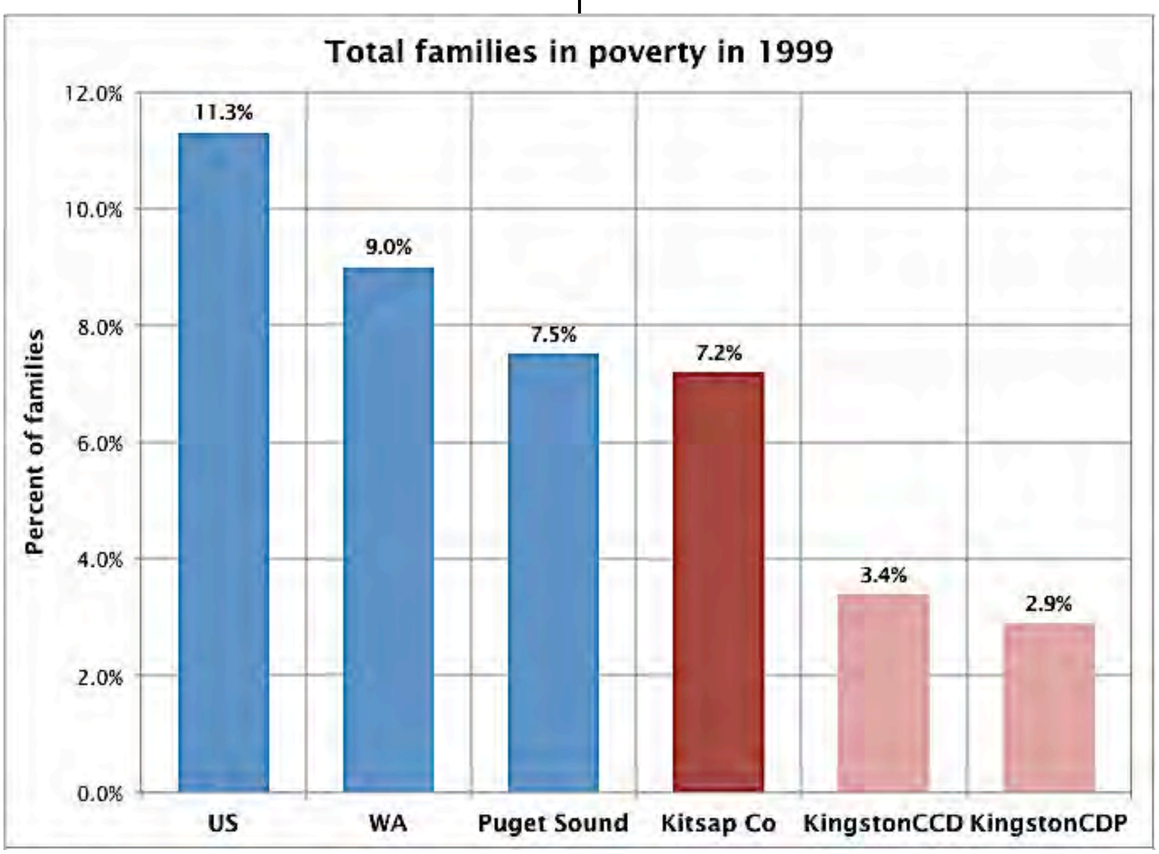

Workers - self-employed in own business
Percent of all workers
25%
20%
15%
10%
5%
0%
6%
6%
6%
7%
13%
19%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP

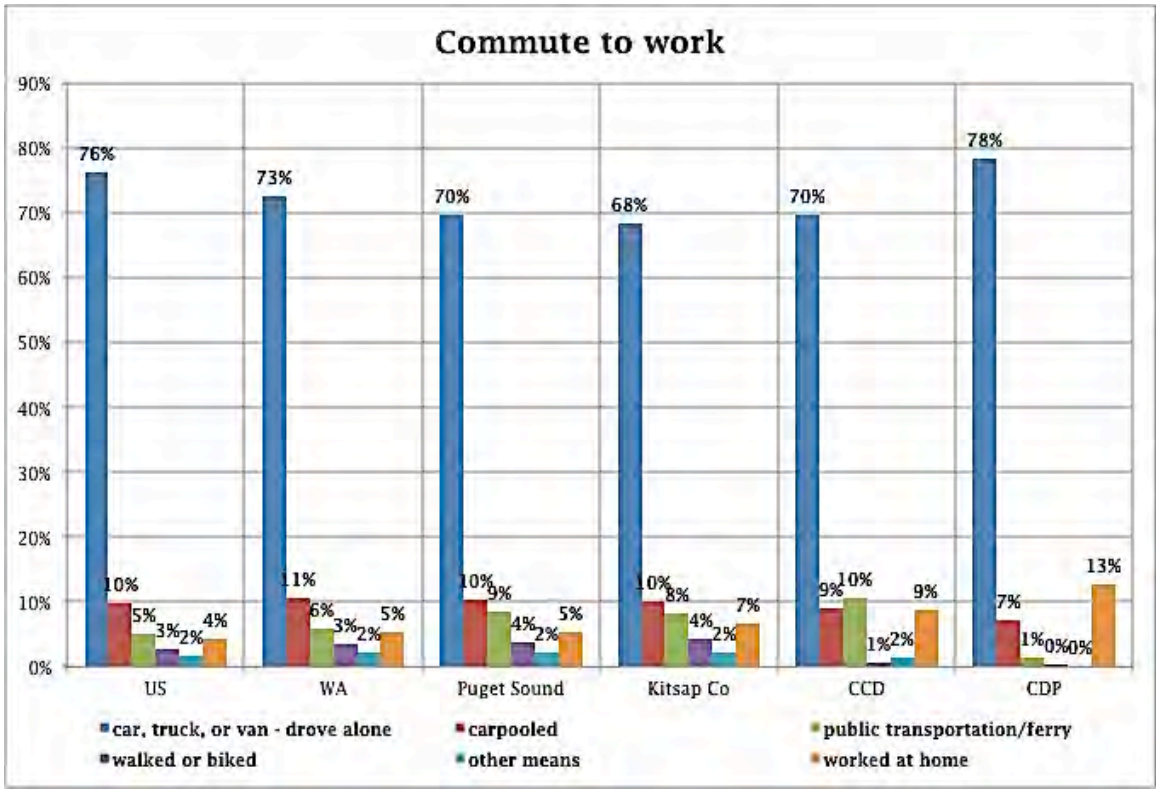

No vehicles available to household
Percent of households
8%
7%
6%
5%
4%
3%
2%
1%
0%
7%
8%
5%
3%
1%
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP


Hispanic or Latino of any race
Percent of population
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
17%
11%
9%
7%
5%
4%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP


Language other than English
Percent of population
25%
20%
15%
10%
5%
0%
21%
19%
21%
9%
6%
6%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP


Percent of Population in Poverty
Percent of population
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
15.4%
13.4%
11.4%
10.4%
7.1%
4.0%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP


Total families in poverty in 1999
Percent of families
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
11.3%
9.0%
7.5%
7.2%
3.4%
2.9%
US
WA
Puget Sound
Kitsap Co
KingstonCCD
KingstonCDP


Commute to work
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
76%
10%
5%
3%
2%
4%
73%
11%
6%
3%
2%
5%
70%
10%
9%
4%
2%
5%
68%
10%
8%
4%
2%
7%
70%
9%
10%
1%
2%
9%
78%
7%
1%
0%
0%
13%
US
WA
Puget Sound
Kitsap Co
CCD
CDP
car, truck, or van - drove alone
carpooled
public transportation/ferry
walked or biked
other means
worked at home

2009-2013 American Community Survey
Comparative social statistics - age and household status

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Persons	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Households	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Average household size	2.63	2.54	2.56	2.51	2.53	2.24
Families	76,744,358	1,697,886	925,090	66,152	3,392	490
Average family size	3.22	3.11	3.10	3.00	2.98	3.08
Percent households in families	66%	65%	63%	68%	71%	55%
Population by age						
0- 4	20,052,112	441,534	240,991	14,727	555	95
5- 9	20,409,060	435,093	231,722	14,316	1,146	150
10-14	20,672,609	438,454	231,638	16,243	906	140
15-19	21,715,074	451,990	235,296	16,906	794	137
20-24	22,099,887	477,368	267,355	29,745	498	77
25-34	41,711,277	956,136	574,151	32,414	1,129	197
35-44	40,874,162	911,601	542,467	29,903	1,395	210
45-54	44,506,268	972,361	558,033	37,318	2,168	265
55-59	20,165,892	458,465	247,544	18,272	1,130	233
60-64	17,479,211	403,238	209,069	17,616	974	151
65-74	22,957,030	493,031	241,161	20,912	1,047	165
75-84	13,220,447	260,041	126,910	10,130	585	139
85+	5,673,565	118,247	60,974	4,183	155	36
Median age	37.3	37.3	37.0	39.3	44.5	44.9
Percent under 18	73,877,478	1,584,900	847,107	55,456	3,126	484
Percent over 18	237,659,116	5,234,679	2,910,208	197,231	9,357	1,513
Percent 18-64	195,808,074	4,363,360	2,481,163	162,006	7,569	1,171
Percent 65+	41,851,042	871,319	429,045	35,225	1,788	342
Family households	76,744,358	1,697,886	925,090	66,152	3,392	490
Percent of all households	66%	65%	63%	68%	71%	55%
Married couple	56,305,876	1,312,388	717,727	52,199	2,775	414
Married couple w/related child	23,085,472	540,776	311,960	20,117	1,000	162
Male only	5,435,145	116,960	63,302	4,543	330	60
Male only w/related child	2,624,246	62,747	32,253	2,512	209	28
Female only	15,003,337	268,538	144,061	9,410	287	16
Female only w/related child	8,455,848	160,886	84,348	5,812	173	16
Non-family households	38,865,858	931,240	544,483	31,470	1,354	399
Percent of all households	34%	35%	37%	32%	29%	45%
Living alone	31,778,729	727,991	420,863	24,898	1,001	368
Over 65	11,296,134	238,638	121,687	8,924	467	173
Total households	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Residence 1 year ago						
Same house 1 year ago	261,288,840	5,573,777	3,049,496	205,920	11,164	1,850
Different house in same county	28,002,833	719,383	415,694	24,518	885	88
Different house in same state	16,690,764	392,321	192,573	16,852	134	2
Elsewhere	46,508,282	1,162,420	661,025	43,492	1,213	137
Population 1 year and over	307,797,122	6,736,197	3,710,521	249,412	12,377	1,987

Comparative social statistics - age and household status

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Persons	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Households	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Average household size	2.63	2.54	2.56	2.51	2.63	2.25
Families	76,744,358	1,697,886	925,090	66,152	3,392	490
Average family size	3.22	3.11	3.10		2.98	3.08
Percent households in families	66%	65%	63%	68%	71%	55%
Population by age						
0- 4	6%	6%	6%	6%	4%	5%
5- 9	7%	6%	6%	6%	9%	8%
10-14	7%	6%	6%	6%	7%	7%
15-19	7%	7%	6%	7%	6%	7%
20-24	7%	7%	7%	12%	4%	4%
25-34	13%	14%	15%	13%	9%	10%
35-44	13%	13%	14%	12%	11%	11%
45-54	14%	14%	15%	15%	17%	13%
55-59	6%	7%	7%	7%	9%	12%
60-64	6%	6%	6%	7%	8%	8%
65-74	7%	7%	6%	8%	8%	8%
75-84	4%	4%	3%	4%	5%	7%
85+	2%	2%	2%	2%	1%	2%
Median age	37.3	37.3	37.0	39.3	44.5	44.9
Percent under 18	24%	23%	23%	22%	25%	24%
Percent over 18	76%	77%	77%	78%	75%	76%
Percent 18-64	63%	64%	66%	64%	61%	59%
Percent 65+	13%	13%	11%	14%	14%	17%
Family households	76,744,358	1,697,886	925,090	66,152	3,392	490
Percent of all households	66%	65%	63%	68%	71%	55%
Married couple	73%	77%	78%	79%	82%	84%
Married couple w/related child	30%	32%	34%	30%	29%	33%
Male only	7%	7%	7%	7%	10%	12%
Male only w/related child	3%	4%	3%	4%	6%	6%
Female only	20%	16%	16%	14%	8%	3%
Female only w/related child	11%	9%	9%	9%	5%	3%
Non-family households	38,865,858	931,240	544,483	31,470	1,354	399
Percent of all households	34%	35%	37%	32%	29%	45%
Living alone	82%	78%	77%	79%	74%	92%
Over 65	29%	26%	22%	28%	34%	43%
Total households	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Residence 1 year ago						
Same house 1 year ago	85%	83%	82%	83%	90%	93%
Different house in same county	9%	11%	11%	10%	7%	4%
Different house in same state	15%	17%	5%	7%	1%	0%
Elsewhere	15%	17%	18%	17%	10%	7%
Population 1 year and over	307,797,122					

Comparative social statistics - education and occupation

Education (age 25+ yrs)	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Less than 9th grade	12,272,805	185,370	81,213	3,100	100	16
9th-12th grade, no diploma	16,614,916	271,071	132,522	7,753	447	63
High school graduate	58,084,465	1,077,511	545,317	40,110	1,924	179
Some college, no degree	43,896,733	1,147,528	608,526	51,268	2,488	549
Associate degree	16,135,795	435,658	234,409	18,165	775	132
Bachelors degree	37,286,246	932,008	614,241	32,367	1,988	350
Graduate or professional degree	22,296,892	525,994	344,081	17,985	862	109
Total	206,587,852	4,575,140	2,560,309	170,748	8,584	1,398
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Total persons 16 years+	246,191,954	5,416,136	3,007,764	204,141	9,652	1,578
Total in labor force	158,197,577	3,526,776	2,055,531	129,528	6,198	991
Total civilian employed	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Total in armed forces	1,083,691	49,891	36,002	11,248	63	31
Occupation	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Managerial, professional	51,341,226	1,215,919	786,096	40,315	2,286	516
Service occupations	25,645,065	550,824	303,985	20,234	1,048	160
Sales and office operations	34,957,520	730,797	422,888	24,683	872	99
Farming, fishing, and forestry			0			
Construction, extraction, maintenance	12,863,316	300,472	144,329	11,199	470	45
Production, transportation	17,057,570	351,718	185,110	10,449	854	67
Industry	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Agriculture, forestry, fishing, mining	2,731,302	81,301	12,076	949	64	17
Construction	8,864,481	194,995	109,278	7,559	417	28
Manufacturing	14,867,423	332,763	214,496	10,876	442	64
Subtotal base industries	26,463,206	609,059	335,850	19,384	923	109
Wholesale trade	3,937,876	94,758	53,347	1,423	99	37
Retail trade	16,415,217	367,492	212,256	12,805	437	89
Transportation, warehouse, utilities	7,010,637	161,661	88,648	3,859	276	0
Information	3,056,318	73,749	53,700	2,202	168	44
Finance, insurance, real estate	9,469,756	178,537	112,425	5,299	219	40
Per capita income	15,300,528	379,884	263,910	12,883	837	110
Education, health, and social services	32,871,216	677,441	378,712	22,143	993	286
Arts, entertainment, recreation	13,262,892	282,686	167,546	9,849	679	146
Other services	7,043,003	151,722	89,323	5,213	383	11
Public administration	7,034,048	172,741	86,691	11,820	516	16
Subtotal service industries	115,401,491	2,540,671	1,506,558	87,496	4,607	779
Total industries	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Private wage and salary	111,790,351	2,426,790	1,459,064	70,631	3,382	554
Government workers	21,087,459	522,143	273,130	28,623	1,416	164
Self-employed in own business	8,775,721	196,386	108,136	7,514	731	170
Unpaid family workers	211,166	4,411	2,078	112	1	0
Total	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Median household income	$53,046	$59,478	$67,981	$62,413	$64,733	$44,492
Median family income	$64,719	$72,168	$84,049	$74,993	$73,272	$66,250
Per capita income	$28,155	$30,742	$35,207	$31,769	$30,888	$30,307

Comparative social statistics - education and occupation

Education (age 25+ yrs)	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Less than 9th grade	6%	4%	3%	2%	1%	1%
9th-12th grade, no diploma	8%	6%	5%	5%	5%	5%
High school graduate	28%	24%	21%	23%	22%	13%
Some college, no degree	21%	25%	24%	30%	9%	9%
Associate degree	8%	10%	9%	11%	9%	9%
Bachelors degree	18%	20%	24%	19%	23%	25%
Graduate or professional degree	11%	11%	13%	11%	10%	8%
Total	206,587,852	4,575,140	2,560,309	170,748	8,584	1,398
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Total persons 16 years+	246,191,954	5,416,136	3,007,764	204,141	9,652	1,578
Total in labor force	64%	65%	68%	63%	64%	63%
Total civilian employed	58%	58%	61%	52%	57%	56%
Total in armed forces	0%	1%	1%	6%	1%	2%
Occupation	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Managerial, professional	36%	39%	43%	38%	41%	58%
Service occupations	18%	17%	16%	19%	19%	18%
Sales and office operations	25%	23%	23%	23%	16%	11%
Farming, fishing, and forestry	0%	0%	0%	0%	0%	0%
Construction, extraction, maintenance	9%	10%	8%	10%	8%	5%
Production, transportation	12%	11%	10%	10%	15%	8%
Industry	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Agriculture, forestry, fishing, mining	2%	3%	1%	1%	1%	2%
Construction	6%	6%	6%	7%	8%	3%
Manufacturing	10%	11%	12%	10%	8%	7%
Subtotal base industries	19%	19%	18%	18%	17%	12%
Wholesale trade	3%	3%	3%	1%	2%	4%
Retail trade	12%	12%	12%	12%	8%	10%
Transportation, warehouse, utilities	5%	5%	5%	4%	5%	0%
Information	2%	2%	3%	2%	3%	5%
Finance, insurance, real estate	7%	6%	6%	5%	4%	5%
Per capita income	11%	12%	14%	12%	15%	12%
Education, health, and social services	23%	22%	21%	21%	18%	32%
Arts, entertainment, recreation	9%	9%	9%	9%	12%	16%
Other services	5%	5%	5%	5%	7%	1%
Public administration	5%	5%	5%	11%	9%	2%
Subtotal service industries	81%	81%	82%	82%	83%	88%
Total industries	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Private wage and salary	79%	77%	79%	66%	61%	62%
Government workers	15%	17%	15%	27%	26%	18%
Self-employed in own business	6%	6%	6%	7%	13%	19%
Unpaid family workers	0%	0%	0%	0%	0%	0%
Total	141,864,697	3,149,730	1,842,408	106,880	5,530	888
Median household income	$53,046	$59,478	$67,981	$62,413	$64,733	$44,492
Median family income	$64,719	$72,168	$84,049	$74,993	$73,272	$66,250
Per capita income	$28,155	$30,742	$35,207	$31,769	$30,888	$30,307

2005-2009 American Community Survey

Comparative social statistics - income

Household (family/nonfamily) income	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
$ 0- 9,999	8,380,364	162,900	80,148	4,995	171	13
$ 10- 14,999	6,214,548	110,745	50,421	3,266	139	70
$ 15- 24,999	12,468,604	240,286	111,578	7,714	317	58
$ 25- 34,999	11,929,761	245,734	119,594	8,962	447	112
$ 35- 49,999	15,723,148	349,666	180,255	12,999	598	209
$ 50- 74,999	20,744,045	492,858	265,868	19,764	1,015	111
$ 75- 99,999	14,107,031	355,758	204,495	14,315	629	145
$ 100-149,999	14,858,239	393,182	252,295	15,530	904	96
$ 150-199,999	5,651,848	148,537	105,906	6,117	330	57
$ 200,000+	5,532,628	129,460	99,013	3,960	196	17
Total	115,610,216	2,629,126	1,469,573	97,622	4,746	888
Individuals in poverty status by age						
Between 18-64 years	14.3%	12.8%	10.8%	10.2%	8.9%	4.5%
Over 65 years	9.4%	7.8%	8.1%	6.1%	2.3%	3.8%
Total in Poverty 18+ years	13.4%	12.0%	10.4%	9.5%	7.7%	4.4%
Percent of Population in Poverty	15.4%	13.4%	11.4%	10.4%	7.1%	4.0%
Total families in poverty in 1999	11.3%	9.0%	7.5%	7.2%	3.4%	2.9%
Married couples	5.6%	4.6%	3.9%	3.2%	1.7%	0.0%
With related children <18 yrs.	8.3%	7.0%	5.6%	4.7%	1.9%	0.0%
With related children <5 yrs.	7.1%	6.0%	5.0%	7.9%	1.6%	0.0%
Female headed families	30.6%	28.2%	23.5%	26.5%	18.1%	0.0%
Female head w/related child <18 yrs.	40.0%	36.7%	31.1%	34.8%	23.8%	0.0%
With related children <5 yrs.	46.9%	46.0%	n/a	49.3%	100.0%	0.0%
Source of income						
Earnings	90,436,935	2,083,690	1,209,598	75,523	3,638	596
Social security	33,386,448	701,620	336,223	27,259	1,415	336
Supplemental security (SSI)	5,716,592	115,783	57,285	4,883	166	41
Public assistance cash income	3,255,213	109,871	53,997	4,421	144	27
Retirement	20,504,523	474,176	237,066	26,407	1,276	291
Amount of income - mean						
Earnings	$75,017	$78,582	$88,638	$77,325	$77,954	$69,421
Social security	$17,189	$17,834	$17,894	$16,344	$17,093	$14,311
Supplemental security (SSI)	$9,152	$9,243	$9,347	$9,896	$13,868	$7,915
Public assistance	$3,808	$3,636	$3,821	$4,323	$23,322	$2,348
Retirement	$23,589	$23,991	$24,865	$28,431	$23,322	$20,289

Comparative social statistics - income

Household (family/nonfamily) income	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
$ 0- 9,999	7%	6%	5%	5%	4%	1%
$ 10- 14,999	5%	4%	3%	3%	3%	8%
$ 15- 24,999	11%	9%	8%	8%	7%	7%
$ 25- 34,999	10%	9%	8%	9%	9%	13%
$ 35- 49,999	14%	13%	12%	13%	13%	24%
$ 50- 74,999	18%	19%	18%	20%	21%	13%
$ 75- 99,999	12%	14%	14%	15%	13%	16%
$ 100-149,999	13%	15%	17%	16%	19%	11%
$ 150-199,999	5%	6%	7%	6%	7%	6%
$ 200,000+	5%	5%	7%	4%	4%	2%
Total	115,610,216	2,629,126	1,469,573	97,622	4,746	888
Individuals in poverty status by age						
Between 18-64 years	14.3%	12.8%	10.8%	10.2%	8.9%	4.5%
Over 65 years	9.4%	7.8%	8.1%	6.1%	2.3%	3.8%
Total in Poverty 18+ years	13.4%	12.0%	10.4%	9.5%	7.7%	4.4%
Percent of Population in Poverty	15.4%	13.4%	11.4%	10.4%	7.1%	4.0%
Total families in poverty in 1999	11.3%	9.0%	7.5%	7.2%	3.4%	2.9%
Married couples	5.6%	4.6%	3.9%	3.2%	1.7%	0.0%
With related children <18 yrs.	8.3%	7.0%	5.6%	4.7%	1.9%	0.0%
With related children <5 yrs.	7.1%	6.0%	5.0%	7.9%	1.6%	0.0%
Female headed families	30.6%	28.2%	23.5%	26.5%	18.1%	0.0%
Female head w/related child <18 yrs.	40.0%	36.7%	31.1%	34.8%	23.8%	0.0%
With related children <5 yrs.	46.9%	46.0%	n/a	49.3%	100.0%	0.0%
Source of income						
Earnings	90,436,935	2,083,690	1,209,598	75,523	3,638	596
Social security	33,386,448	701,620	336,223	27,259	1,415	336
Supplemental security (SSI)	5,716,592	115,783	57,285	4,883	166	41
Public assistance cash income	3,255,213	109,871	53,997	4,421	144	27
Retirement	20,504,523	474,176	237,066	26,407	1,276	291
Amount of income - mean						
Earnings	$75,017	$78,582	$88,638	$77,325	$77,954	$69,421
Social security	$17,189	$17,834	$17,894	$16,344	$17,093	$14,311
Supplemental security (SSI)	$9,152	$9,243	$9,347	$9,896	$13,868	$7,915
Public assistance	$3,808	$3,636	$3,821	$4,323	$23,322	$2,348
Retirement	$23,589	$23,991	$24,865	$28,431	$23,322	$20,289

Comparative social statistics - occupied housing units

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Total housing units	132,057,804	2,899,538	1,579,978	107,607	5,448	993
Occupied housing units	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Percent owner occupied	75,075,700	1,661,427	897,274	65,834	3,847	615
Percent renter occupied	40,534,516	967,699	572,299	31,788	899	274
Vacant housing units	16,447,588	270,412	110,405	9,985	702	104
Rooms						
1 room	2,553,564	65,390	38,929	1,279	79	0
2 rooms	3,201,898	107,570	66,756	2,255	134	0
3 rooms	11,969,458	271,270	165,488	7,480	212	52
4 rooms	21,898,345	470,762	251,666	14,947	539	179
5 rooms	26,953,670	521,728	260,763	21,244	1,215	287
6 rooms	23,982,342	480,521	247,731	21,480	1,263	212
7 rooms	16,285,507	360,196	193,680	15,759	774	128
8 rooms	11,276,514	263,337	148,339	10,529	650	39
9 rooms or more	13,936,506	358,765	206,627	12,634	582	96
Mean number of rooms	5.5	5.5	5.5	5.8	5.9	5.4
Year Structure Built						
2010+	771,765	22,739	12,871	551	24	12
2000-2009	19,385,497	482,239	259,001	15,866	1,183	160
1990 to 1999	18,390,124	503,803	259,785	23,217	1,646	304
1980 to 1989	18,345,244	404,931	246,850	18,275	808	180
1970 to 1979	21,042,566	500,294	249,157	20,048	682	0
1960 to 1969	14,634,125	286,167	178,352	7,699	380	92
1950 to 1959	14,464,282	231,524	124,013	5,151	89	14
1940 to 1949	7,231,811	149,715	78,941	7,328	224	83
1939 or earlier	17,792,390	318,126	171,008	9,472	412	148
Total housing units	132,057,804	2,899,538	856,720	107,607	5,448	993
Units in structure						
1, detached	81,459,725	1,839,045	948,666	74,781	4,663	610
1, attached	7,686,211	105,420	67,156	4,544	66	58
2	4,973,523	75,165	37,514	2,170	16	0
3 or 4	5,854,632	109,136	64,945	3,177	82	82
5-9	6,299,169	139,072	91,452	4,870	12	12
10-19	5,921,860	146,616	102,610	3,865	142	142
20+	11,227,563	273,250	202,147	5,528	58	43
Mobile home/trailer	8,525,947	206,059	63,236	8,482	409	46
Boat, rv, van, etc.	109,174	5,775	2,252	190	0	0
Total	132,057,804	2,899,538	1,579,978	107,607	5,448	993

Comparative social statistics - occupied housing units

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Total housing units	132,057,804	2,899,538	1,579,978	107,607	5,448	993
Occupied housing units	115,610,216	2,629,126	1,469,573	97,622	4,746	889
Percent owner occupied	65%	63%	61%	67%	81%	69%
Percent renter occupied	35%	37%	39%	33%	19%	31%
Vacant housing units	12.5%	9%	7%	9%	13%	10%
Rooms						
1 room	2%	2%	5%	1%	1%	0%
2 rooms	2%	4%	8%	2%	2%	0%
3 rooms	9%	9%	19%	7%	4%	5%
4 rooms	17%	16%	29%	14%	10%	18%
5 rooms	20%	18%	30%	20%	22%	29%
6 rooms	18%	17%	29%	20%	23%	21%
7 rooms	12%	12%	23%	15%	14%	13%
8 rooms	9%	9%	17%	10%	12%	4%
9 rooms or more	11%	12%	24%	12%	11%	10%
Mean number of rooms	5.5	5.5	5.5	5.8	5.9	5.4
Year Structure Built						
2010+	1%	1%	1%	1%	0%	1%
2000-2009	15%	17%	16%	15%	22%	16%
1990 to 1999	14%	17%	16%	22%	30%	31%
1980 to 1989	14%	14%	16%	17%	15%	18%
1970 to 1979	16%	17%	16%	19%	13%	0%
1960 to 1969	11%	10%	11%	7%	7%	9%
1950 to 1959	11%	8%	8%	5%	2%	1%
1940 to 1949	5%	5%	5%	7%	4%	8%
1939 or earlier	13%	11%	11%	9%	8%	15%
Total housing units	132,057,804	2,899,538	1,579,978	107,607	5,448	993
Units in structure						
1, detached	62%	63%	60%	69%	86%	61%
1, attached	6%	4%	4%	4%	1%	6%
2	4%	3%	2%	2%	0%	0%
3 or 4	4%	4%	4%	3%	2%	8%
5-9	5%	5%	6%	5%	0%	1%
10-19	4%	5%	6%	4%	3%	14%
20+	9%	9%	13%	5%	1%	4%
Mobile home/trailer	6%	7%	4%	8%	8%	5%
Boat, rv, van, etc.	0%	0%	0%	0%	0%	0%
Total	132,057,804	2,899,538	1,579,978	107,607	5,448	993

Comparative social statistics - housing value

Value (owner-occupied units)	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
$ 0- 49,999	6,758,685	81,822	32,456	2,311	70	0
$ 50- 99,999	11,667,301	71,130	15,941	2,024	122	82
$ 100-149,999	12,050,742	144,872	38,911	4,143	151	0
$ 150-199,999	11,404,296	242,935	90,046	9,558	399	165
$ 200-299,999	13,773,829	447,670	240,190	21,182	1,192	204
$ 300-499,999	11,725,843	439,459	298,760	17,794	1,389	95
$ 500-999,999	6,141,492	198,433	153,219	7,363	467	69
$1,000,000+	1,553,512	35,106	27,751	1,459	57	0
Total	75,075,700	1,661,427	897,274	65,834	3,847	615
Median value	$176,700	$262,100	$324,111	$268,200	$299,300	$255,700
With a mortgage	49,820,840	1,186,017	681,465	47,851	2,855	469
Without a mortgage	25,254,860	475,410	215,809	17,983	992	146
Owner costs as % of household income where owner has a mortgage						
Less than 20.0%	18,028,668	370,833	201,571	15,535	861	107
20.0-24.9%	7,959,603	198,189	112,812	7,746	529	103
25.0-29.9%	5,944,989	158,546	93,914	6,606	313	73
30.0-34.9%	4,210,179	119,499	71,064	4,593	281	77
35.0+%	13,426,164	333,635	199,393	13,111	856	109
Total	49,569,603	1,180,702	678,754	47,591	2,840	469
Not computed	251,237	5,315	2,713	260	15	0
Rent (renter-occupied units)						
$ 0- 200	618,429	13,586	7,033	338	2	0
$ 200- 299	1,248,924	22,922	12,062	829	15	13
$ 300- 499	2,984,207	48,954	17,348	1,229	2	0
$ 500- 749	8,358,370	161,297	59,158	3,874	90	0
$ 750- 999	9,291,346	243,276	136,397	7,888	241	141
$ 1,000-1,499	10,067,165	285,004	197,221	11,686	254	81
$ 1,500+	5,768,176	154,591	125,970	4,408	224	39
Total	38,336,617	929,630	555,189	30,252	828	274
Median rent	$904	$973	$1,094	$1,035	$1,080	$951
No cash rent	2,197,899	38,069	17,110	1,536	71	0
Gross rent as % of household income in 1999						
less than 15%	4,355,942	100,306	58,214	2,869	35	21
15.0-19.9%	4,515,103	116,202	72,657	4,000	105	0
20.0-24.9%	4,671,489	120,270	74,887	3,669	216	24
25.0-29.9%	4,328,624	114,151	69,687	3,655	62	46
30.0-34.9%	3,403,489	86,863	51,957	3,550	63	60
35.0+%	16,178,004	376,319	218,142	11,935	312	123
Total	37,452,651	914,111	545,544	29,678	793	274
Not computed	3,081,865	53,588	26,755	2,110	106	0

Comparative social statistics - housing value

Value (owner-occupied units)	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
$ 0- 49,999	9%	5%	4%	4%	2%	0%
$ 50- 99,999	16%	4%	2%	3%	3%	13%
$ 100-149,999	16%	9%	4%	6%	4%	0%
$ 150-199,999	15%	15%	10%	15%	10%	27%
$ 200-299,999	18%	27%	27%	32%	31%	33%
$ 300-499,999	16%	26%	33%	27%	36%	15%
$ 500-999,999	8%	12%	17%	11%	12%	11%
$1,000,000+	2%	2%	3%	2%	1%	0%
Total	75,075,700	1,661,427	897,274	65,834	3,847	615
Median value	$176,700	$262,100	$324,111	$268,200	$299,300	$255,700
With a mortgage	66.4%	71.4%	75.9%	72.7%	74.2%	76.3%
Without a mortgage	33.6%	28.6%	24.1%	27.3%	25.8%	23.7%
Owner costs as % of household income where owner has a mortgage						
Less than 20.0%	36%	31%	30%	33%	30%	23%
20.0-24.9%	16%	17%	17%	16%	19%	22%
25.0-29.9%	12%	13%	14%	14%	11%	16%
30.0-34.9%	8%	10%	10%	10%	10%	16%
35.0+%	27%	28%	29%	28%	30%	23%
Total	49,569,603	1,180,702	678,754	47,591	2,840	469
Not computed	251,237	5,315	2,713	260	15	0
Rent (renter-occupied units)						
$ 0- 200	2%	1%	1%	1%	0%	0%
$ 200- 299	3%	2%	2%	3%	2%	5%
$ 300- 499	8%	5%	3%	4%	0%	0%
$ 500- 749	22%	17%	11%	13%	11%	0%
$ 750- 999	24%	26%	25%	26%	29%	51%
$ 1,000-1,499	26%	31%	36%	39%	31%	30%
$ 1,500+	15%	17%	23%	15%	27%	14%
Total	38,336,617	929,630	555,189	30,252	828	274
Median rent	$904	$973	$1,094	$1,035	$1,080	$951
No cash rent	2,197,899	38,069	17,110	1,536	71	0
Gross rent as % of household income in 1999						
less than 15%	12%	11%	11%	10%	4%	8%
15.0-19.9%	12%	13%	13%	13%	13%	0%
20.0-24.9%	12%	13%	14%	12%	27%	9%
25.0-29.9%	12%	12%	13%	12%	8%	17%
30.0-34.9%	9%	10%	10%	12%	8%	22%
35.0+%	43%	41%	40%	40%	39%	45%
Total	37,452,651	914,111	545,544	29,678	793	274
Not computed	3,081,865	53,588	26,755	2,110	106	0

Comparative social statistics - transportation characteristics

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Employed workers 16 years and older	139,786,639	3,126,887	1,841,637	115,821	5,454	873
Commute to work						
Car, truck, or van - drove alone	106,725,474	2,271,702	1,283,717	79,253	3,793	684
Car, truck, or van - carpooled	13,631,263	330,814	191,113	11,766	495	63
Public transportation/taxi/ferry	7,000,722	182,046	157,154	9,584	572	13
Walked or biked	3,922,801	109,051	67,051	5,092	35	2
Other means	2,459,994	65,372	39,242	2,453	82	0
Worked at home	6,046,385	167,902	100,069	7,673	477	111
Total	139,786,639	3,126,887	1,838,346	115,821	5,454	873
Mean travel time to work in minutes	25.5	25.7	28.0	29.7	41.3	36.7
Vehicles per occupied housing unit(owner an	115,610,216	2,629,126	1,469,573	97,622	4,746	889
0 vehicle	10,483,077	178,568	110,429	5,105	139	13
1 vehicle	39,051,590	814,379	479,056	27,716	1,054	337
2 vehicles	43,402,846	1,000,785	555,992	38,452	1,814	356
3+ vehicles	22,672,703	635,394	324,096	26,349	1,729	183

Comparative social statistics - transportation characteristics

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Employed workers 16 years and older	139,786,639	3,126,887	1,841,637	115,821	5,454	873
Commute to work						
Car, truck, or van - drove alone	76%	73%	70%	68%	70%	78%
Car, truck, or van - carpooled	10%	11%	10%	10%	9%	7%
Public transportation/taxi/ferry	5%	6%	9%	8%	10%	1%
Walked or biked	3%	3%	4%	4%	1%	0%
Other means	2%	2%	2%	2%	2%	0%
Worked at home	4%	5%	5%	7%	9%	13%
Total	139,786,639	3,126,887	1,838,346	115,821	5,454	873
Mean travel time to work in minutes	25.5	25.7	28.0	29.7	41.3	36.7
Vehicles per occupied housing unit(owner an	115,610,216	2,629,126	1,469,573	97,622	4,746	889
0 vehicle	9%	7%	8%	5%	3%	1%
1 vehicle	34%	31%	33%	28%	22%	38%
2 vehicles	38%	38%	38%	39%	38%	40%
3+ vehicles	20%	24%	22%	27%	36%	21%

Comparative social statistics - race and language

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
One race	302,804,261	6,495,108	3,548,295	236,806	11,697	1,950
Two or more races	8,732,333	324,471	209,020	15,881	786	47
Race alone or in combination with one or more other races						
White	230,592,579	5,350,936	2,767,791	207,760	11,176	1,832
Black or African American	39,167,010	245,041	201,591	6,970	127	0
American Indian and Alaska Native	2,540,309	94,194	37,019	3,381	832	39
Asian	15,231,962	498,941	418,375	11,874	693	103
Native Hawaiian and other Pacific Islander	526,347	40,695	30,702	2,210	153	70
Some other race	14,746,054	324,471	146,023	4,611	339	0
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Hispanic or Latino of any race	51,786,591	783,693	337,373	16,650	617	79
Not Hispanic or Latino	259,750,003	6,035,886	3,419,942	236,037	11,866	1,918
Population 5 years and over	291,484,482	6,378,045	3,516,322	237,960	11,928	1,902
English only	213,122,908	5,195,196	2,777,740	216,960	11,242	1,788
Language other than English	60,361,574	1,182,849	738,582	21,000	686	114
Speak English less than very well	25,148,900	500,051	302,990	6,836	300	60
Spanish	37,458,624	521,751	215,052	7,430	325	46
Speak English less than very well	16,344,473	232,157	90,733	2,677	157	22
Other languages	22,902,950	661,098	523,530	13,570	361	68
Speak English less than very well	8,804,427	267,894	212,257	4,159	133	38

Comparative social statistics - race and language

	US	WA	Puget Sound	Kitsap Co	Kingston CCD	Kingston CDP
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
One race	97%	95%	94%	94%	94%	98%
Two or more races	3%	5%	6%	6%	6%	2%
Race alone or in combination with one or more other races						
White	74%	78%	74%	82%	90%	92%
Black or African American	13%	4%	5%	3%	1%	0%
American Indian and Alaska Native	1%	1%	1%	1%	7%	2%
Asian	5%	7%	11%	5%	6%	5%
Native Hawaiian and other Pacific Islander	0%	1%	1%	1%	1%	4%
Some other race	5%	5%	4%	2%	3%	0%
Total population	311,536,594	6,819,579	3,757,315	252,687	12,483	1,997
Hispanic or Latino of any race	17%	11%	9%	7%	5%	4%
Not Hispanic or Latino	83%	89%	91%	93%	95%	96%
Population 5 years and over	291,484,482	6,378,045	3,516,322	237,960	11,928	1,902
English only	73%	81%	79%	91%	94%	94%
Language other than English	21%	19%	21%	9%	6%	6%
Speak English less than very well	42%	42%	41%	33%	44%	53%
Spanish	13%	8%	6%	3%	3%	2%
Speak English less than very well	44%	44%	42%	36%	48%	48%
Other languages	8%	10%	15%	6%	3%	4%
Speak English less than very well	38%	41%	41%	31%	37%	56%

Retail sales projections

Washington State Department of Revenue (DOR) collects retail sales taxes on all retail sales conducted in Washington State. DOR correlates retail sales by the North American Industrial Classification System (NAICS) defining sales by 6 digit industry classifications able to distinguish sales in convenience stores, for example, from supermarkets, meat markets, fish and seafood markets, fruit and vegetable markets, baked good stores, and all other specialty food stores. DOR collects but does not report sales per store classification when the number of stores is so low that reporting would disclose the sales for any particular store.

DOR collects retail sales data by municipal jurisdiction since the retail sales tax is shared between state and local jurisdictions. In Kitsap County, DOR data is available for 2014 retail sales for Bainbridge Island, Poulsbo, Bremerton, Port Orchard, and by inference unincorporated Kitsap County.

Urban Land Institute's (ULI) publication Dollars & Cents of Shopping Centers correlates retail sales per square foot of different types of stores located in strip, specialty, neighborhood, community, and regional shopping centers and districts. Except for some specialty centers, the stores are franchises located in newer buildings with efficient stocking and manageable checkout counters. Older buildings occupied by non-franchise stores will likely not perform at as high square foot sales as ULI's data indicates.

Kingston estimates – were derived for Kingston's CCD for 2013 and 2025 by correlating ACS population totals and projections with the retail sales per capita estimates for Bainbridge Island (the closest comparable developed retail area) and the retail sales per square foot for specialty and neighborhood shopping centers (the closest store type comparable).

The projected 2013 sales per store were subtracted from the 2025 projected retail sales to derive the additional square footage sales potential that population growth will create between the time periods.

Retail square footage available

Convenience	**2013**	**2025**	**13-25**
Supermarket	31,959	35,283	3,324
Hardware	18,618	20,555	1,936
Nursery/garden	17,925	19,789	1,864
Snack/beverage	6,935	7,656	721
Drug/pharmacy	6,544	7,224	681
Pet/supplies	5,085	5,614	529
Comparable	**2013**	**2025**	**13-25**
Sporting goods	11,435	12,624	1,183
Family clothing	11,379	12,562	1,183
Furniture	10,540	11,637	1,096
Shoe stores	5,289	5,840	550
Book stores	4,924	5,436	512
Sewing/needle	4,804	5,303	500
Women clothes	4,269	4,713	444
Specialty foods	3,845	4,245	400
Office supplies	3,694	4,078	384
Hobby/toy	2,222	2,454	231
Florists	2,207	2,437	230
Specialty	**2013**	**2025**	**13-25**
Restaurants – full service	39,202	43,279	4,077
Restaurants – limited service	15,436	17,042	1,605
Art dealers	3,056	3,373	318

Sources: DOR, OFM, ULI

- **Convenience goods stores** – (supermarket, hardware, nursery, drug) generate the largest potential square footage currently and by 2025 with the potential square footage increases to compensate for local resident consumer population growth.

A significant portion of this potential, however, has been claimed with the Albertsons, Sav-On and Rite Aid Pharmacy developments west of Kingston at the intersection of State Highway 104 and Hansville Road, and Thriftway Center in Kingston proper.

- **Comparable goods stores** – (family and women's clothing, furniture, shoes, office supplies) generate significant potential square footage now and through 2025.

Very little of this market has been recruited currently within Kingston proper or the Hansville intersection for local consumer populations.

- **Specialty or destination goods stores** – (restaurants, sporting goods, drinking places, pets, books, sewing, art, hobby) generate notable square footage potential particularly if these stores are not currently resident within the local market.

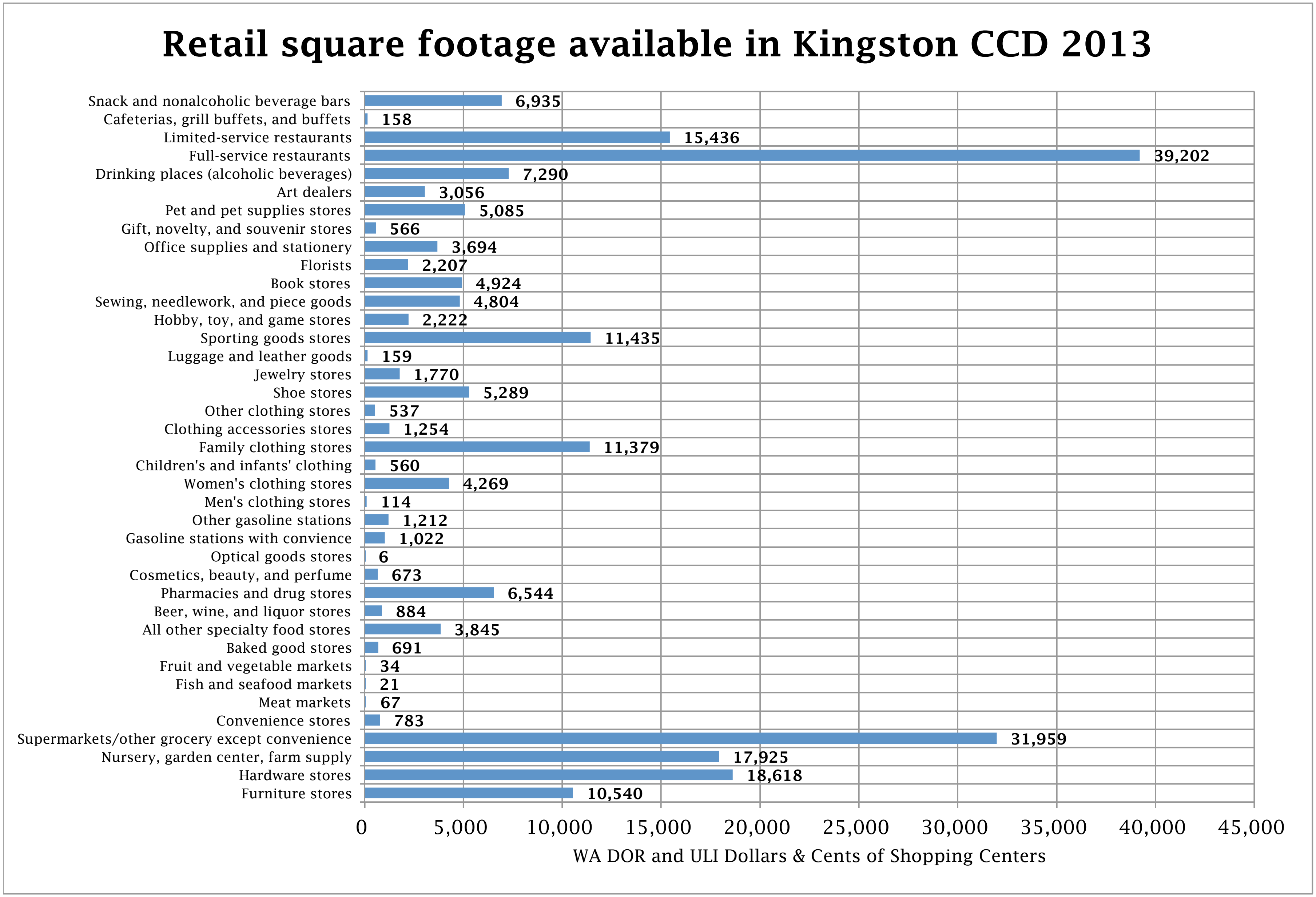
Kingston proper has recruited a significant number of limited and full-service restaurants and drinking establishments oriented to local, commuter, and tourist consumers. While this segment may be close to current saturation it is a constantly changing, fluid market.

Kingston has not recruited, however, other residual specialty stores including sporting goods, pets, books, sewing, art, and hobby of local resident, commuter, and tourist consumer potential.

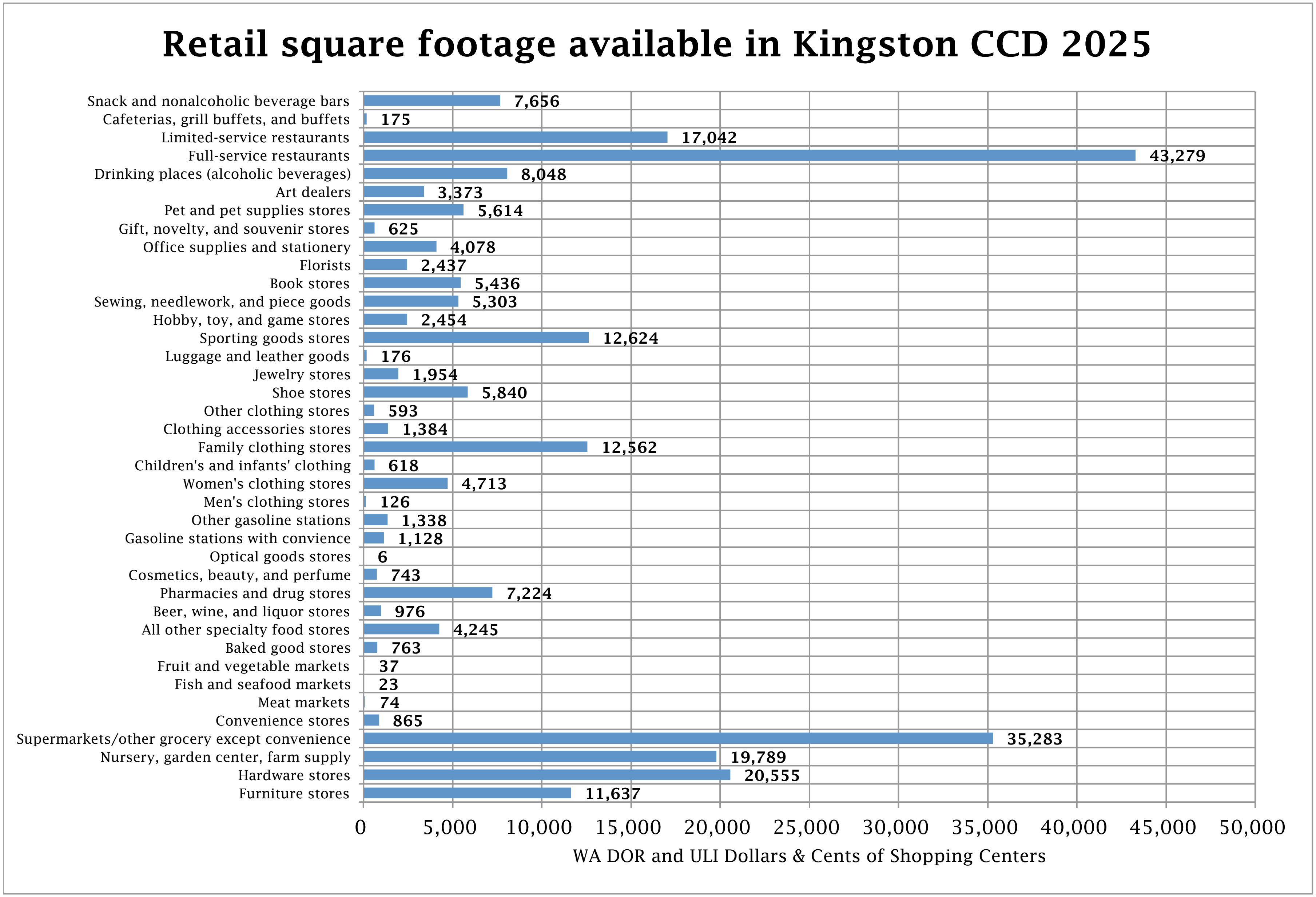
Note – the above comments assume existing stores have captured or serve the current market well with good products, service, prices, displays, operating hours, invested ownership and management, and other features.

In actuality, retail businesses have a high turnover rate where these characteristics may not be well provided, market conditions and preferences change as due economic impacts on consumer behavior, and ownership and managements evolve. The sales and square footage estimates represent a benchmark to be maintained through the natural business evolutions which affect all retail centers.

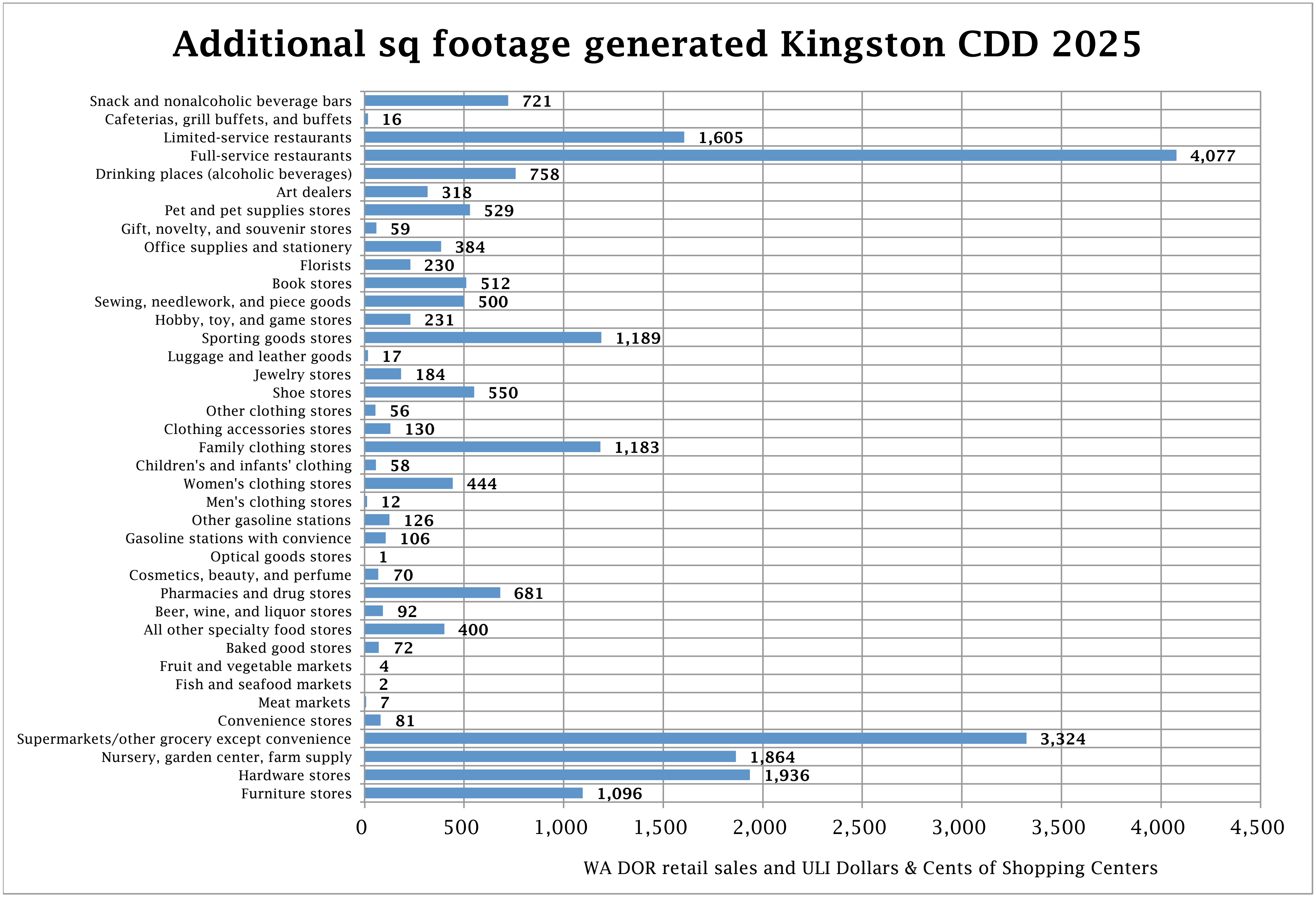
Also note – the per capita sales averages for Bainbridge Island include sales to local residents as well as commuters and tourists. These averages should be typical of most Kingston sales to local residents, commuters, and tourists as well for most of the store lines indicated. However, the projections do not include potential hotel, motel, bed-and-breakfast consumption nor sales related to weddings, corporate retreats, or conferences.



Retail square footage available in Kingston CCD 2013
Snack and nonalcoholic beverage bars
6,935
Cafeterias, grill buffets, and buffets
158
Limited-service restaurants
15,436
Full-service restaurants
39,202
Drinking places (alcoholic beverages)
7,290
Art dealers
3,056
Pet and pet supplies stores
5,085
Gift, novelty, and souvenir stores
566
Office supplies and stationery
3,694
Florists
2,207
Book stores
4,924
Sewing, needlework, and piece goods
4,804
Hobby, toy, and game stores
2,222
Sporting goods stores
11,435
Luggage and leather goods
159
Jewelry stores
1,770
Shoe stores
5,289
Other clothing stores
537
Clothing accessories stores
1,254
Family clothing stores
11,379
Children's and infants' clothing
560
Women's clothing stores
4,269
Men's clothing stores
114
Other gasoline stations
1,212
Gasoline stations with convience
1,022
Optical goods stores
6
Cosmetics, beauty, and perfume
673
Pharmacies and drug stores
6,544
Beer, wine, and liquor stores
884
All other specialty food stores
3,845
Baked good stores
691
Fruit and vegetable markets
34
Fish and seafood markets
21
Meat markets
67
Convenience stores
783
Supermarkets/other grocery except convenience
31,959
Nursery, garden center, farm supply
17,925
Hardware stores
18,618
Furniture stores
10,540
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
WA DOR and ULI Dollars & Cents of Shopping Centers



Retail square footage available in Kingston CCD 2025
Snack and nonalcoholic beverage bars 7,656
Cafeterias, grill buffets, and buffets 175
Limited-service restaurants 17,042
Full-service restaurants 43,279
Drinking places (alcoholic beverages) 8,048
Art dealers 3,373
Pet and pet supplies stores 5,614
Gift, novelty, and souvenir stores 625
Office supplies and stationery 4,078
Florists 2,437
Book stores 5,436
Sewing, needlework, and piece goods 5,303
Hobby, toy, and game stores 2,454
Sporting goods stores 12,624
Luggage and leather goods 176
Jewelry stores 1,954
Shoe stores 5,840
Other clothing stores 593
Clothing accessories stores 1,384
Family clothing stores 12,562
Children's and infants' clothing 618
Women's clothing stores 4,713
Men's clothing stores 126
Other gasoline stations 1,338
Gasoline stations with convience 1,128
Optical goods stores 6
Cosmetics, beauty, and perfume 743
Pharmacies and drug stores 7,224
Beer, wine, and liquor stores 976
All other specialty food stores 4,245
Baked good stores 763
Fruit and vegetable markets 37
Fish and seafood markets 23
Meat markets 74
Convenience stores 865
Supermarkets/other grocery except convenience 35,283
Nursery, garden center, farm supply 19,789
Hardware stores 20,555
Furniture stores 11,637
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
WA DOR and ULI Dollars & Cents of Shopping Centers


Additional sq footage generated Kingston CDD 2025
Snack and nonalcoholic beverage bars
721
Cafeterias, grill buffets, and buffets
16
Limited-service restaurants
1,605
Full-service restaurants
4,077
Drinking places (alcoholic beverages)
758
Art dealers
318
Pet and pet supplies stores
529
Gift, novelty, and souvenir stores
59
Office supplies and stationery
384
Florists
230
Book stores
512
Sewing, needlework, and piece goods
500
Hobby, toy, and game stores
231
Sporting goods stores
1,189
Luggage and leather goods
17
Jewelry stores
184
Shoe stores
550
Other clothing stores
56
Clothing accessories stores
130
Family clothing stores
1,183
Children's and infants' clothing
58
Women's clothing stores
444
Men's clothing stores
12
Other gasoline stations
126
Gasoline stations with convience
106
Optical goods stores
1
Cosmetics, beauty, and perfume
70
Pharmacies and drug stores
681
Beer, wine, and liquor stores
92
All other specialty food stores
400
Baked good stores
72
Fruit and vegetable markets
4
Fish and seafood markets
2
Meat markets
7
Convenience stores
81
Supermarkets/other grocery except convenience
3,324
Nursery, garden center, farm supply
1,864
Hardware stores
1,936
Furniture stores
1,096
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
WA DOR retail sales and ULI Dollars & Cents of Shopping Centers

Kingston retail sales potentials 2013-2025 by NAICS Industry

		Per capita retail sales				Retail sales Kingston CCD			Retail sf available		2025
		Washingt	Unincorp	Bainbridge		2013	2025	Sales	2013	2025	net sf
NAICS		State	Kitsap	Island	Kingston	12,483	13,781	sq ft	12,483	31,292	available
442110	Furniture stores	$161.56	$83.54	$124.42	$124.42	$1,553,165.65	$1,714,695	$147.35	10,540	11,637	1,096
444130	Hardware stores	$104.95	$15.02	$213.73	$213.73	$2,668,020.82	$2,945,495	$143.30	18,618	20,555	1,936
444220	Nursery, garden center, farm supply	$59.97	$27.25	$205.77	$205.77	$2,568,649.36	$2,835,789	$143.30	17,925	19,789	1,864
445110	Supermarkets/other grocery except convenience	$401.58	$188.93	$888.65	$888.65	$11,093,008.53	$12,246,681	$347.10	31,959	35,283	3,324
445120	Convenience stores	$66.36	$21.78	d	$21.78	$271,879.74	$300,155	$347.10	783	865	81
445210	Meat markets	$1.86	d	d	$1.86	$23,218.38	$25,633	$347.10	67	74	7
445220	Fish and seafood markets	$0.59	d	d	$0.59	$7,364.97	$8,131	$347.10	21	23	2
445230	Fruit and vegetable markets	$1.51	$0.12	$0.94	$0.94	$11,734.77	$12,955	$347.10	34	37	4
445291	Baked good stores	$10.49	$19.22	d	$19.22	$239,923.26	$264,875	$347.10	691	763	72
445299	All other specialty food stores	$8.13	$0.17	$32.65	$32.65	$407,582.06	$449,971	$106.00	3,845	4,245	400
445310	Beer, wine, and liquor stores	$24.58	$12.44	$17.99	$17.99	$224,629.94	$247,991	$254.10	884	976	92
446110	Pharmacies and drug stores	$129.77	$61.84	$214.08	$214.08	$2,672,372.91	$2,950,300	$408.40	6,544	7,224	681
446120	Cosmetics, beauty, and perfume	$34.82	$17.95	$14.82	$14.82	$184,998.71	$204,239	$275.00	673	743	70
446130	Optical goods stores	$2.61	$1.79	$0.07	$0.07	$882.80	$975	$159.18	6	6	1
447110	Gasoline stations with convience	$186.33	$106.66	d	$106.60	$1,330,687.80	$1,469,079	$1,302.00	1,022	1,128	106
447190	Other gasoline stations	$44.57	$47.55	$126.42	$126.42	$1,578,137.57	$1,742,264	$1,302.00	1,212	1,338	126
448110	Men's clothing stores	$13.36	$12.67	$1.54	$1.54	$19,201.43	$21,198	$167.96	114	126	12
448120	Women's clothing stores	$49.23	$23.86	$57.44	$57.44	$716,963.45	$791,528	$167.96	4,269	4,713	444
448130	Children's and infants' clothing	$12.40	$6.32	$7.53	$7.53	$94,006.84	$103,784	$167.96	560	618	58
448140	Family clothing stores	$329.19	$224.68	$153.11	$153.11	$1,911,216.20	$2,109,983	$167.96	11,379	12,562	1,183
448150	Clothing accessories stores	$23.48	$13.73	$16.87	$16.87	$210,564.90	$232,464	$167.96	1,254	1,384	130
448190	Other clothing stores	$39.40	$23.48	$7.23	$7.23	$90,269.48	$99,658	$167.96	537	593	56
448210	Shoe stores	$50.23	$37.63	$70.08	$70.08	$874,816.61	$965,798	$165.39	5,289	5,840	550
448310	Jewelry stores	$56.89	$38.97	$39.72	$39.72	$495,830.79	$547,397	$280.09	1,770	1,954	184
448320	Luggage and leather goods	$14.92	$1.27	$2.03	$2.03	$25,336.35	$27,971	$159.18	159	176	17
451110	Sporting goods stores	$191.50	$123.46	$174.05	$174.05	$2,172,687.95	$2,398,647	$190.00	11,435	12,624	1,189
451120	Hobby, toy, and game stores	$49.94	$64.60	$29.05	$29.05	$362,598.05	$400,308	$163.15	2,222	2,454	231
451130	Sewing, needlework, and piece goods	$20.23	$33.02	$55.41	$55.41	$691,720.23	$763,659	$144.00	4,804	5,303	500
451211	Book stores	$43.24	$43.91	$56.80	$56.80	$708,985.42	$782,720	$144.00	4,924	5,436	512
453110	Florists	$12.00	$4.84	$25.46	$25.46	$317,817.50	$350,871	$144.00	2,207	2,437	230
453210	Office supplies and stationery	$92.40	$39.98	$42.61	$42.61	$531,901.76	$587,220	$144.00	3,694	4,078	384
453220	Gift, novelty, and souvenir stores	$32.41	$20.66	$8.45	$8.45	$105,462.78	$116,431	$186.32	566	625	59
453910	Pet and pet supplies stores	$60.91	$52.58	$58.66	$58.66	$732,239.65	$808,393	$144.00	5,085	5,614	529
453920	Art dealers	$7.08	$2.65	$38.96	$38.96	$486,389.68	$536,974	$159.18	3,056	3,373	318
722410	Drinking places (alcoholic beverages)	$104.34	$23.98	$130.98	$130.98	$1,634,969.94	$1,805,007	$224.28	7,290	8,048	758
722511	Full-service restaurants	$741.09	$338.63	$704.34	$704.34	$8,792,220.45	$9,706,611	$224.28	39,202	43,279	4,077
722513	Limited-service restaurants	$461.81	$271.59	$277.34	$277.34	$3,462,059.12	$3,822,113	$224.28	15,436	17,042	1,605
722514	Cafeterias, grill buffets, and buffets	$10.96	$2.84	d	$2.84	$35,451.72	$39,139	$224.28	158	175	16
722515	Snack and nonalcoholic beverage bars	$165.35	$75.33	$124.60	$124.60	$1,555,324.20	$1,717,078	$224.28	6,935	7,656	721

Sources: Retail sales WA Department of Revenue (DOR), Population Office of Financial Management (OFM), Sq ft sales ULI Dollars & Cents of Shopping Centers
2013 population Washington State = 6,882,400, Unincorporated Kitsap County = 170,505, Bainbridge Island = 23,190.
d - records not disclosable due to confidentiality requirements.

Catalytic site envelope studies

Catalytic sites - are properties that are vacant, underdeveloped, for sale, under public ownership or otherwise available for development that have the potential to stimulate development elsewhere in Kingston.

There are numerous properties in the Kingston study area that meet these criteria. Three sites, however, are the most obvious and offer different development and land use impacts of most interest and immediate impact – 1) the former Kingston Lumber Yard on NE State Highway 104, 2) WSDOT public parking lot on NE 1st Street, and 3) Port of Kingston property on Washington Boulevard NE.

Envelope studies - are quick sketch assessments of the potential ways a property can be utilized for development. The purpose of an envelope analysis is to determine alternatives by which the property can be developed or reutilized to meet market interest, parking and access requirements, development regulations, and economic feasibility.

Envelope studies are not final design documents. There are numerous variations possible during a project design and development process that may refine the results of an envelope analysis or even create entirely different configurations and uses to meet market interests and economic feasibilities as well as development regulations. It is also possible that the results of the envelope analysis may also lead to revisions in development regulations that better fit practical physical constraints and market opportunities and feasibilities.

Kingston Lumber – is a vacant for sale property located at 19010 and 190320 NE State Highway 104 at the northern most edge of the streetscape study area. The site slopes upwards 5-10 feet from south to north across the lower portion of the property. The property includes significant frontage on State Highway 104 as well as Lindvog Road NE.

This envelope analysis focuses on the potential retrofitting of the 2-story building fronting on SR-104 and the 1-story building behind Kingston Financial Center adjacent to the access road into Thriftway Center.

WSDOT ferry parking lot - includes 2 parcels located on NE 1st Street with frontage on NE 1st Street and potential access from Ohio and Iowa Avenues NE. The site slopes upwards 10-15 feet from east to west across the property.

This envelope analysis focuses on the potential redevelopment of this property for 1) a low-density mixed-use retail/housing development, 2) a high-density housing development, and 3) a boutique hotel with retail components all of which have view potentials of the marina, Edmonds, and Mount Rainer as well as direct walking access to the retail core on NE State Highway 104.

Port of Kingston property – is located on the south side of Washington Boulevard NE between Central Avenue NE and NE State Highway 104 access to the WSDOT Kingston/Edmonds Ferry Terminal. The site slopes sharply upwards 10-15 feet from south to north from the grassy park area to the corner of Washington Boulevard NE and NE State Highway 104. This portion of the Port property is currently used for surface parking and a maintenance storage building.

This envelope analysis focuses on the potential development of 1) a mixed-use retail and conference facility and 2) a mixed-use retail, boutique hotel, conference center that would be **placed over a parking platform wholly contained on the Port's property on the south side of Washington Boulevard NE** with direct access to and expansion of the grassy park area and views of the marina, Edmonds, and Mount Rainier.

While envelope analyses and market studies are useful, they are not necessarily predictors of potential developer or investor interests. They can be useful, however, to stimulate potential developer or investor interest that will lead to immediate, and thus catalytic project results.

HVS hotel development findings

HVS Consulting and Valuation Services conducted a Hotel Development Findings analysis for the Kitsap County Economic Development Alliance in May of 2015.

The objective of KVS's analysis was to determine the viability of a hotel development project in Kingston – specifically whether the local market was "ripe" for a new hotel project, and if so, what type.

KVS looked at local demand generators including 1) local users, 2) businesses, 3) small corporate retreats, and 4) leisure travel including weekend getaways and weddings.

Market challenges identified by KVS included a new 94 room hotel scheduled to be opened by the Port Gamble S'Klallam Tribe in the summer of 2016, a 98 room and 15,000 square foot meeting room expansion of the Squamish Clearwater Casino facilities, and a potential but unverified hotel project in Poulsbo by Lorig Associates.

KVS found "that the local (Kingston downtown) market is generally deficient when it comes to its offering ancillary facilities that support a thriving and vibrant downtown and that would subsequently support a hotel…A focus on redeveloping the downtown core to more of a destination would increase the appeal of a hotel project significantly…A redesign of the infrastructure through the town could assist in capturing more visitors coming off of the ferry."

"HVS also discovered that a lack of community pride and cohesion among private and public entities has had a disruptive effect on the community, stunting business development and expansion."

"Based on the abovementioned factors, (KVS) believe that near-term development of a hotel in Kingston is not viable, but the areas does have several key drivers that could support a hotel project. The following are examples of hotel projects to consider for the community's long-term strategic plan:

- Boutique waterfront property with meeting space
- Boutique hotel in downtown Kingston with walkability to restaurants, shops, and galleries
- Restaurant with a small "inn", where the inn is an additional revenue source rather than the primary revenue source
- Bed-and-Breakfast with 5 to 10 units"

Correlating KVS findings, Kingston Complete Streets, catalytic site envelope studies, and potential developer interest

KVS recommendations are reflected in the catalytic site envelope studies, particularly for the boutique hotel and meeting, retail, and meeting space options for the WSDOT ferry parking lot and Port of Kingston property examples.

Kingston's Complete Streets design concepts will calm ferry traffic, and more importantly, establish stronger walkable connections between the ferry terminal, waterfront, and downtown better able to attract "walk-on" ferry visitors.

Assuming public and private entities in Kingston coalesce around common marketing, promotion, development strategies, and implementing actions, it would appear most of the variables defined by KVS could be in place.

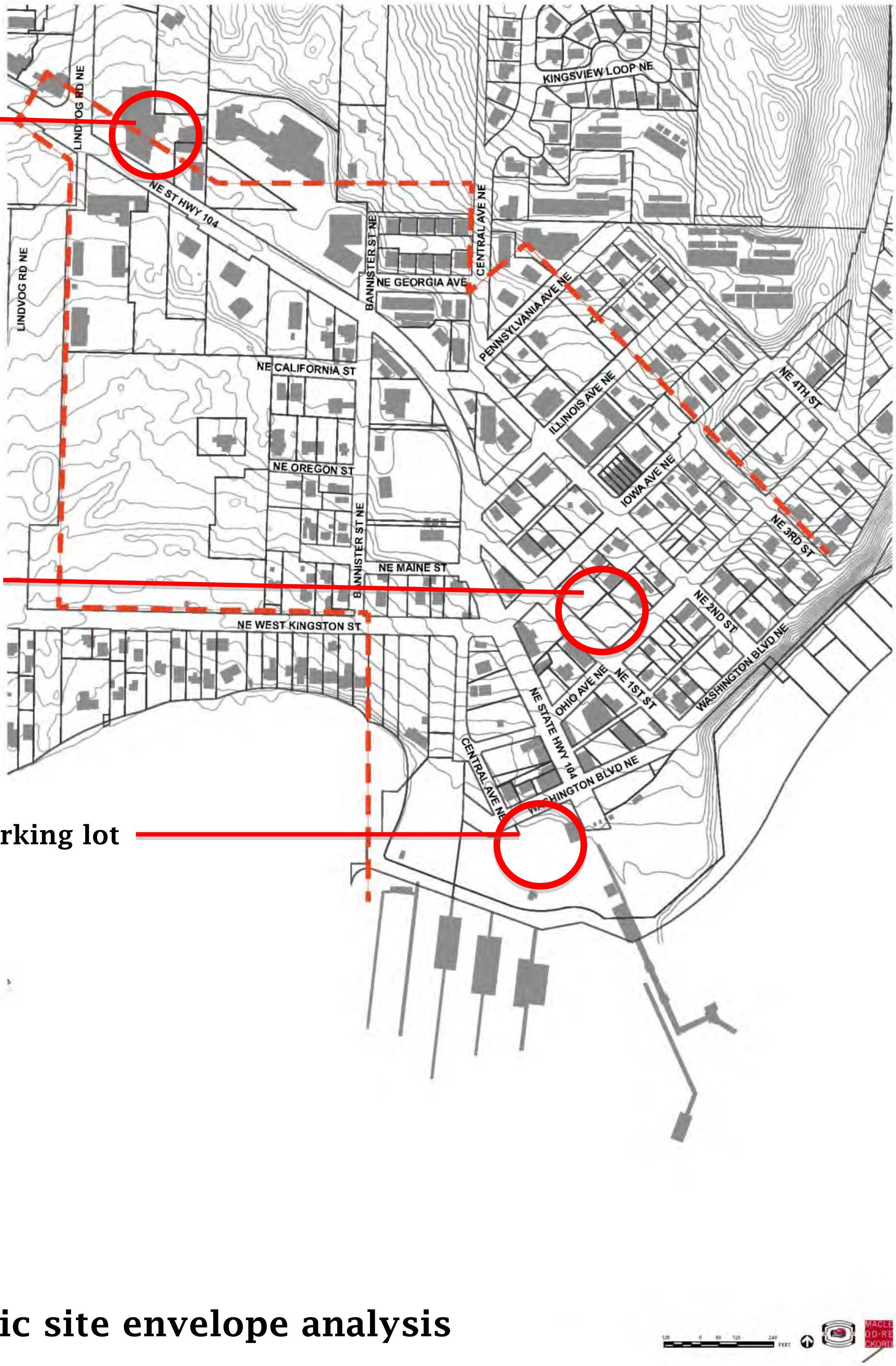
Market studies, while important, are inherently analytical estimates of opportunities that do not include the opinions of catalytic agents – hotel developers.

Consequently, given the factors mentioned above, it is time to "shop" Kingston's boutique hotel and meeting facility opportunities and options, particularly the WSDOT and Port of Kingston properties, with developers of similar prototypes that were profiled in Friday Harbor, Langley, LaConner, Port Ludlow, and Gig Harbor to determine actual market interest, timing, and other particulars with which to proceed with a Kingston offering and development projects.

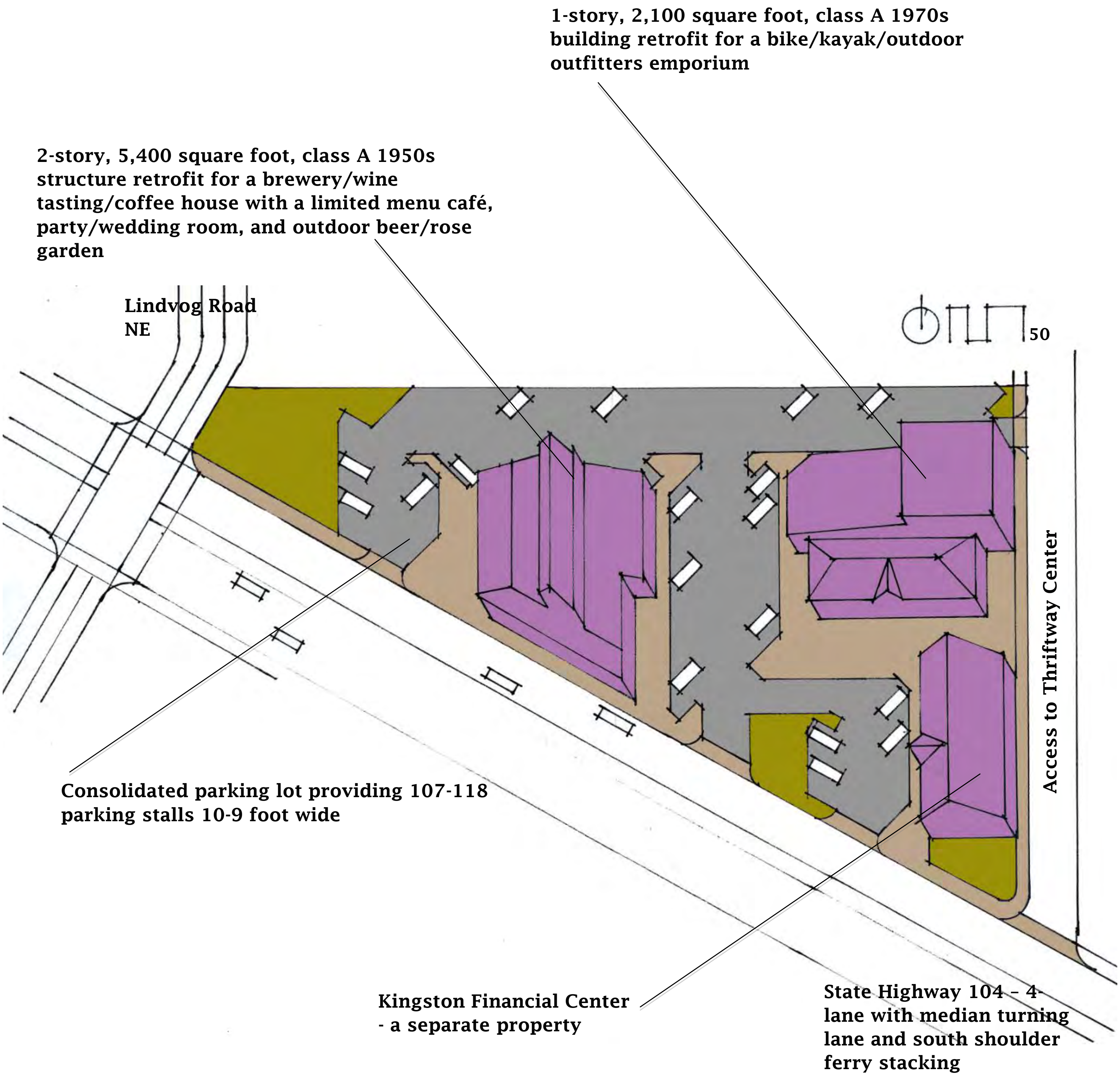
Kingston Lumber

WSDOT parking lot

Port of Kingston parking lot



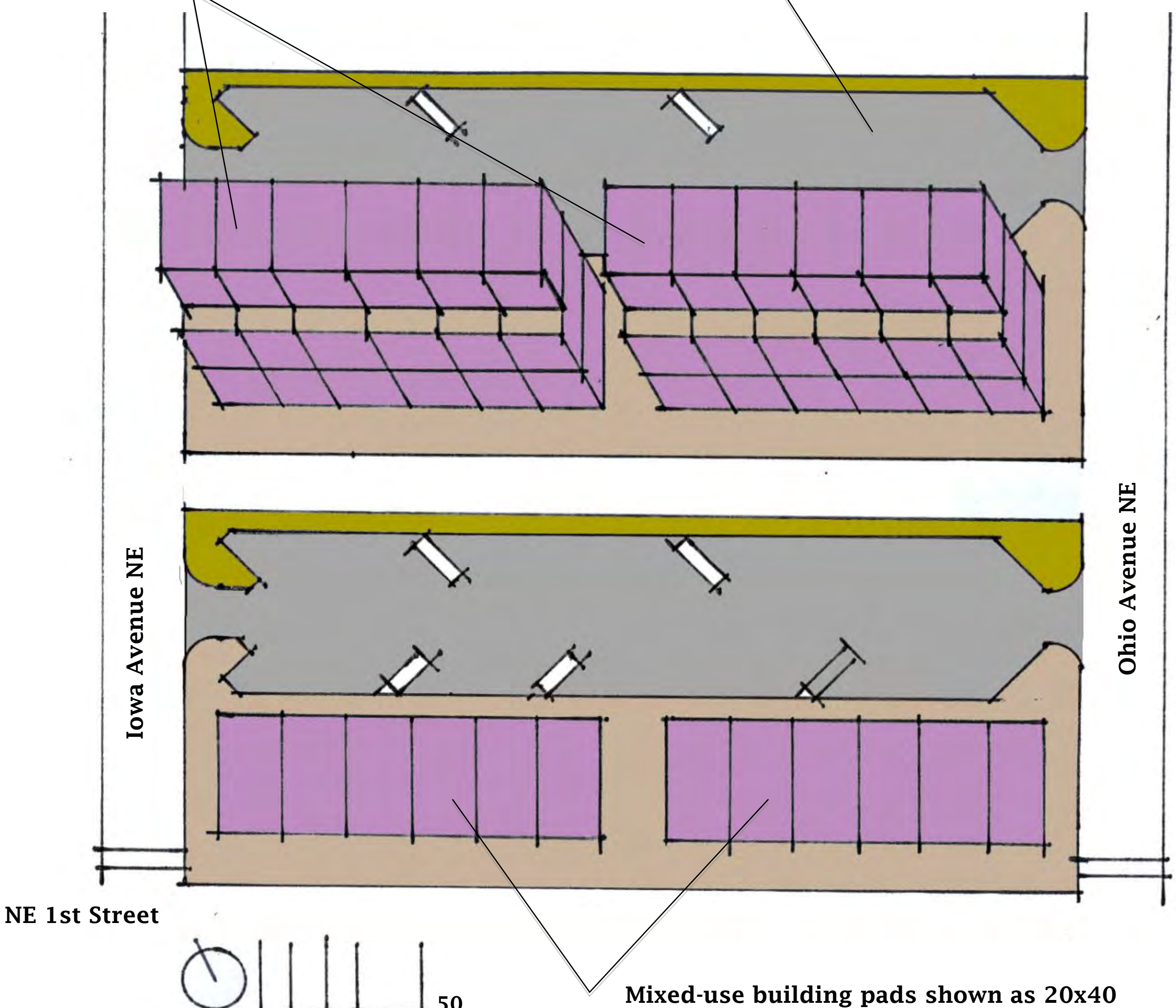
Catalytic site envelope analysis



Kingston Lumber retrofit

Consolidated parking lot providing 50-55 parking stalls 10-9 foot wide with the option of covering the northern parking aisle for housing occupants

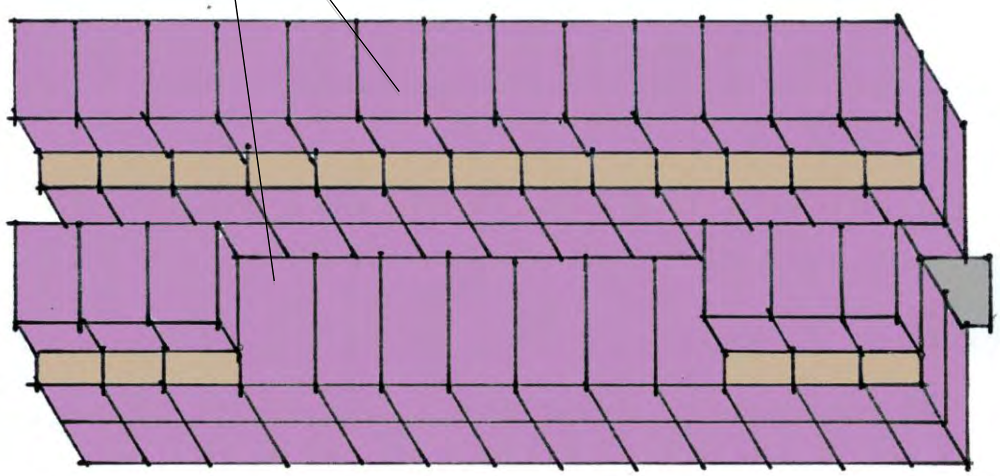
12 upper floor 2-story housing units shown as 20x40 foot or 800 square foot second story with 20x30 foot or 600 square foot third story with 10x20 foot terrace or 1,400 square foot living area total. Housing units could be made larger or smaller to fit market interests. Density equals 20 units/acre.

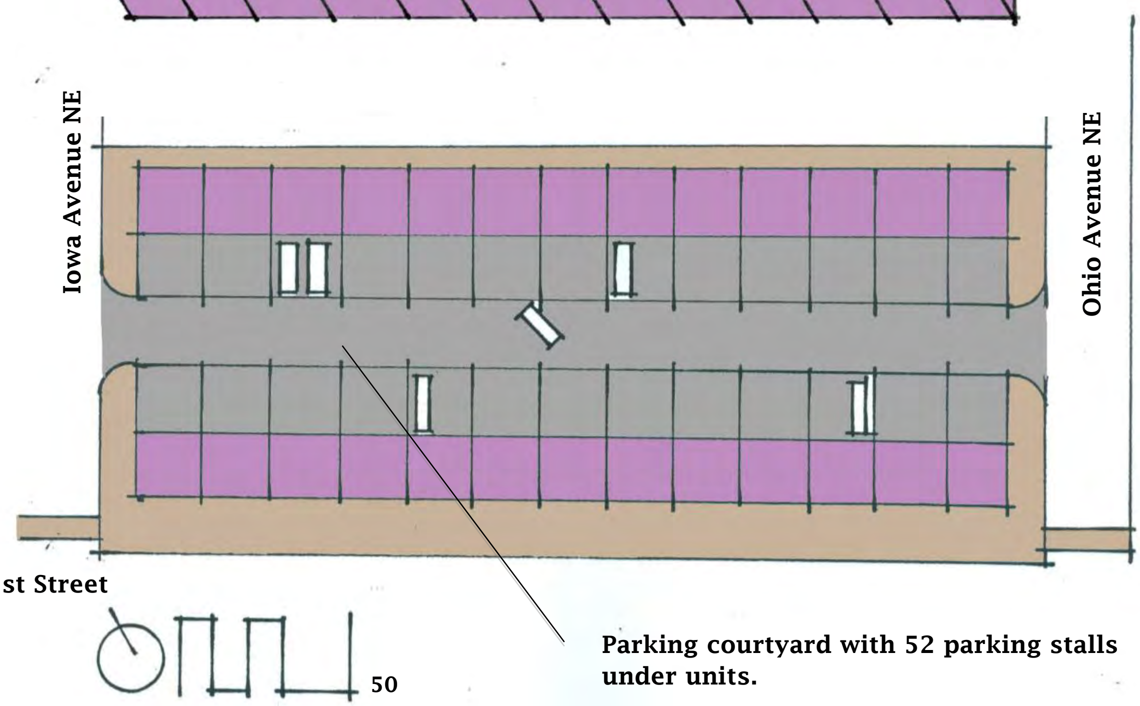


Mixed-use building pads shown as 20x40 foot modules providing 9,600 square foot divisible retail on ground floor with access from NE 1st Street and by arcade from rear parking lot

WSDOT parking lot – low-density mixed-use option

26 townhouse units shown as 2 and 3-story 20x40 foot modules providing 2 car garage and 20x20 foot or 400 square foot 1st floor living or studio space, 20x40 foot or 800 square foot 2nd floor living space or 1,200 total square foot living area in 2-story units, and 20x30 foot or 600 square foot 3rd floor living area with 10x20 foot or 200 square foot terrace or 1,800 total square foot living area in 3-story units. Housing units could be made smaller or larger to fit market interests with 1 or 2 car parking stalls under. Density equals 44 units/acre.

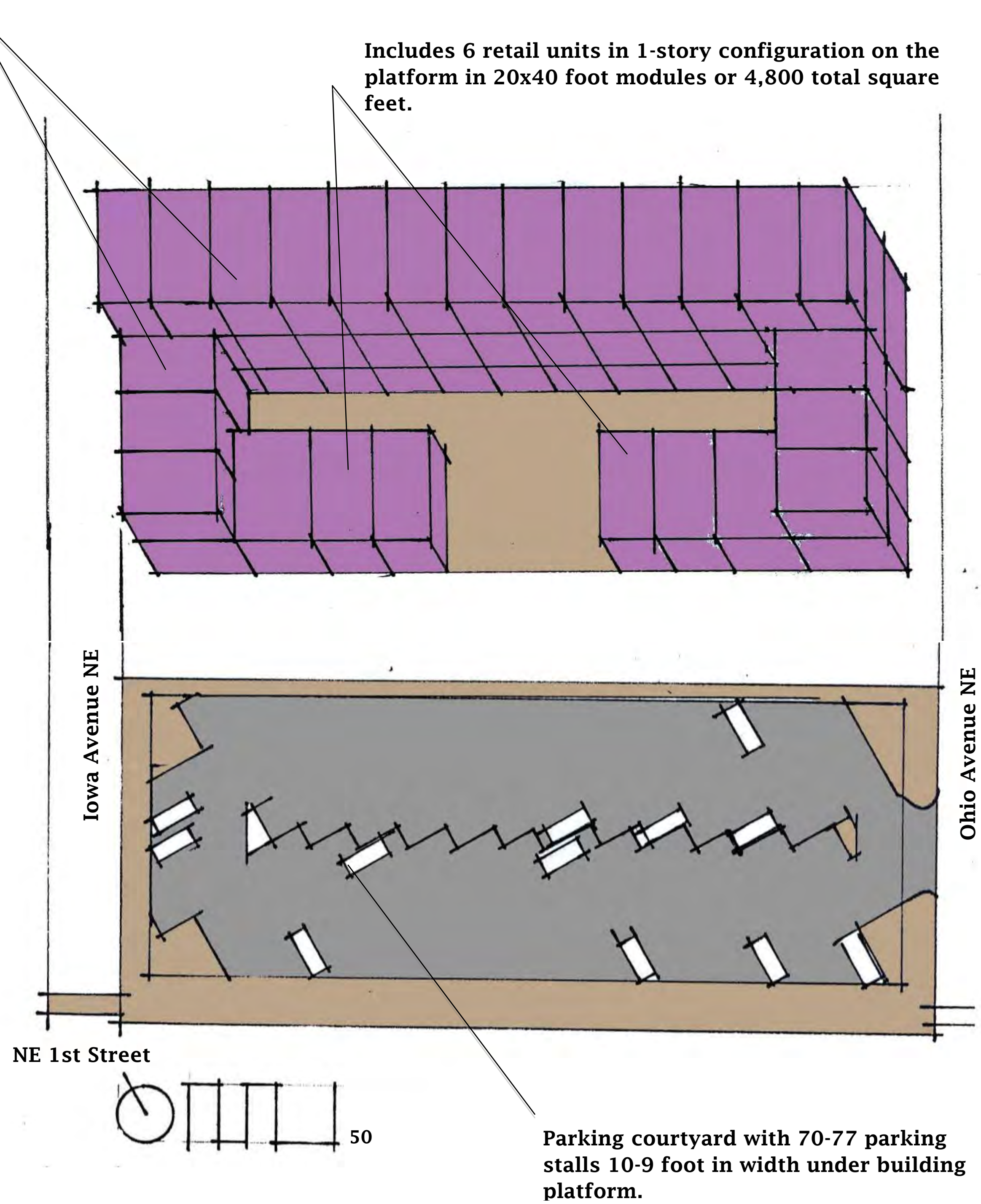




WSDOT parking lot – high-density residential option*

*** this footprint may also be configured for a boutique hotel – see the boutique hotel option**

51 boutique hotel rooms 20x25 foot (subtracting hallways and balconies) or 500 net square foot stacked in 2 and 3-stories around a central courtyard platform over parking. Hotel rooms could be made smaller or larger to fit market interests



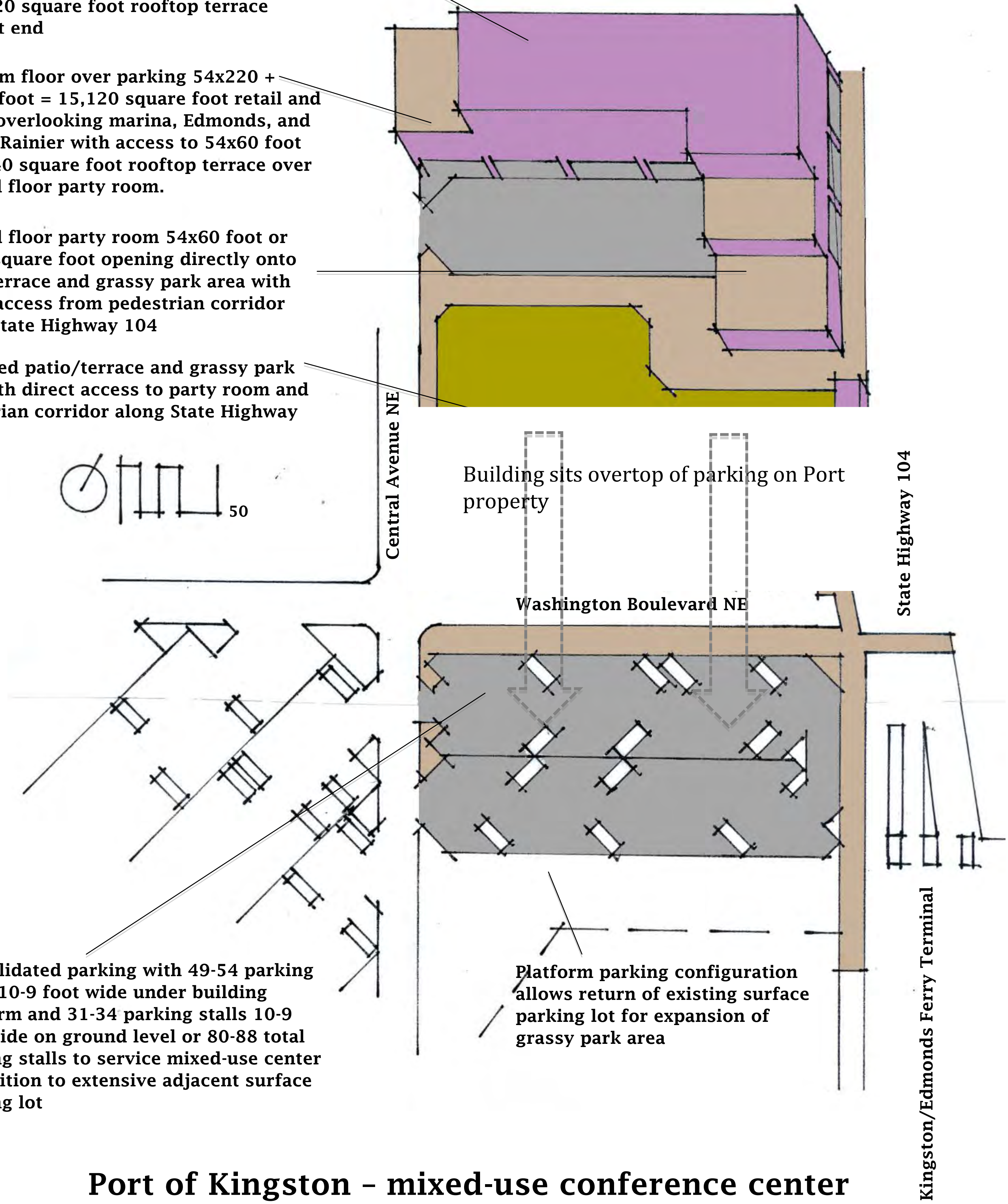
WSDOT parking lot – boutique hotel option

Upper floor 54x180 + 20x60 = 10,920 square foot meeting and conference rooms with commercial kitchen service with access to 54x40 foot or 2,160 square foot rooftop terrace on west side and 54x30 foot or 1,620 square foot rooftop terrace on east end

Platform floor over parking 54x220 + 54x60 foot = 15,120 square foot retail and office overlooking marina, Edmonds, and Mount Rainier with access to 54x60 foot or 3,240 square foot rooftop terrace over ground floor party room.

Ground floor party room 54x60 foot or 3,240 square foot opening directly onto patio terrace and grassy park area with direct access from pedestrian corridor along State Highway 104

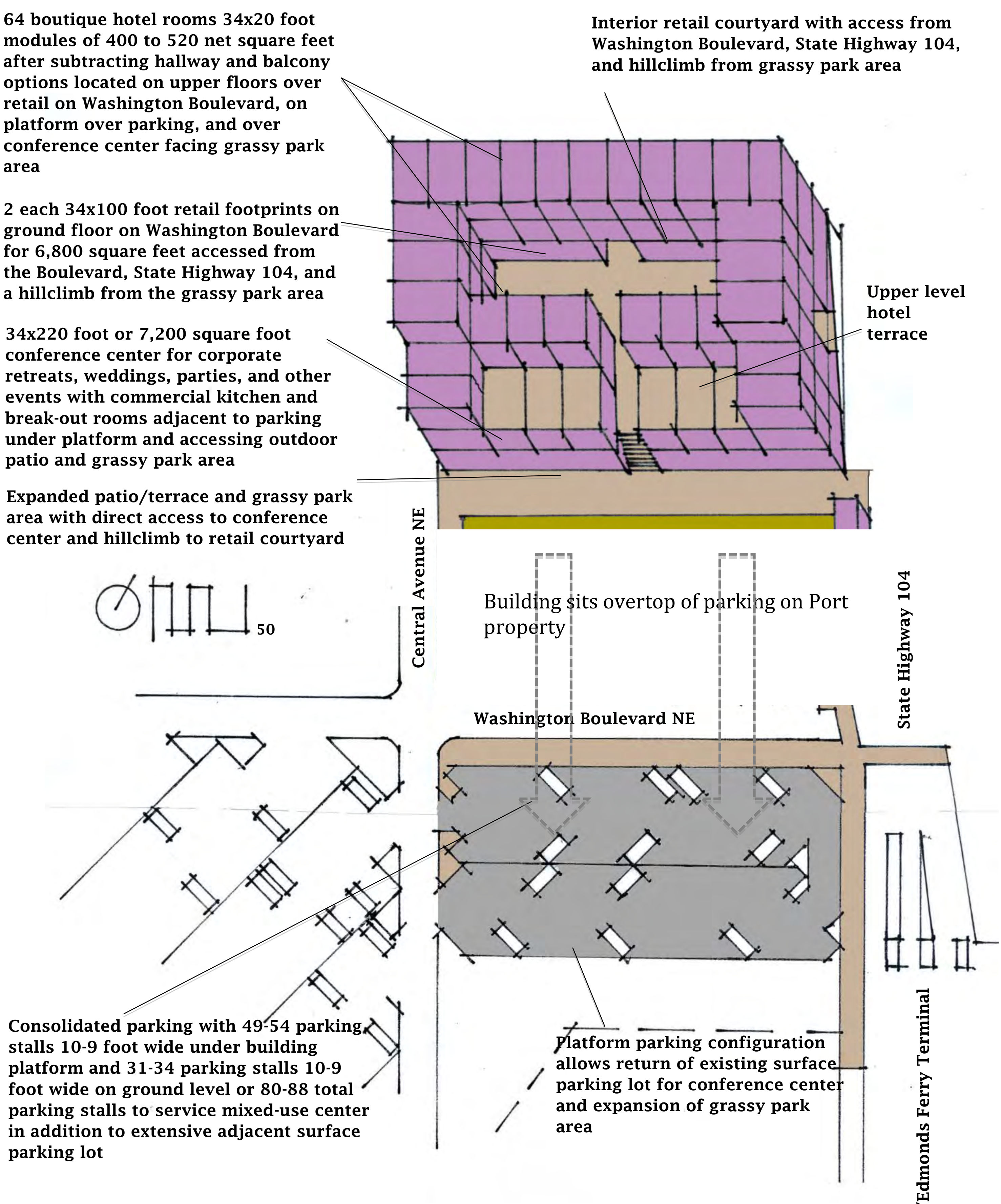
Expanded patio/terrace and grassy park area with direct access to party room and pedestrian corridor along State Highway 104



Consolidated parking with 49-54 parking stalls 10-9 foot wide under building platform and 31-34 parking stalls 10-9 foot wide on ground level or 80-88 total parking stalls to service mixed-use center in addition to extensive adjacent surface parking lot

Platform parking configuration allows return of existing surface parking lot for expansion of grassy park area

Port of Kingston – mixed-use conference center



Port of Kingston – mixed-use retail/boutique hotel/conference center*

***option of converting some hotel rooms to office suites**

Boutique hotel prototypes

Boutique hotel is a term used in North America and the United Kingdom to describe small hotels in unique settings with upscale accommodations.

Many boutique hotels are furnished in a themed, stylish and/or aspirational manner. The popularity of the boutique concept has prompted some multi-national hotel companies to try and capture a market share.

Boutique hotels are also found in resort destinations with exotic amenities such as electronics, spas, yoga, and/or painting classes – and cater to weddings, business retreats, and other social gatherings as well as individual travellers.

Characteristics

Intimate size - a boutique hotel is small, not much bigger than 100 rooms. But not too small - if it doesn't have at least 10 rooms, it's not a boutique hotel but a B&B or inn. A boutique hotel's intimate size produces its characteristic personal feeling and ambiance.

Independently owned - and/or it may be a member of a luxury hotel association. A boutique hotel is not generic, blah, or bland. It is one-of-a-kind with an independent character.

Modern or designer decor with a quirky touch - in keeping with an of-the-moment point of view, décor in a boutique hotel favors sleek materials and stark palettes with bold color splashes.

Urban setting - where the ambiance feels right, often, the small size of an urban boutique hotel affords it a dead-center location in the heart of town.

Ultra-personal service - a small hotel means better service. A good boutique hotel makes exceptional, personal, five-star hospitality service its mission.

Eccentric with a sense of humor – providing room details and guest programs such as a tiger-shaped faux-fur rug before the fireplace, a vibration-platform machine in the gym.

Focus on food and beverage - featuring restaurants and bars that draw a citywide crowd. Often, the hotel has a celebrity-chef eatery in its lobby with a stylish bar or lounge with a modern cocktail menu or even an adjoining brew pub or winery.

Northwest examples

The following are examples of boutique hotels with summary descriptions of their services, amenities, and characteristics.

LaConner, Washington

LaConner Channel Lodge

La Conner's only waterfront hotel boasts Northwest styling, water views and an ideal location for business meetings and travel as well as a romantic getaway. The Lodge has a flagstone entryway, cedar-shake siding, gardens, a lush lobby furnishings aside a famed river-rock fireplace, a library alcove, and an outdoor patio on the Swinomish Channel.

The La Conner Channel Lodge and nearby Country Inn can provide for all events from 5 to 200 people with all-inclusive services including planning, catering, group dinners, group activities for:

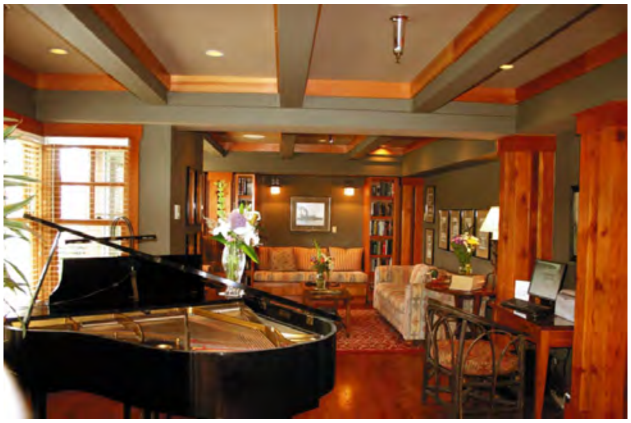
- Board & Staff Retreats
- Association Meetings
- Leadership Trainings
- Budget Planning Sessions
- Nonprofit Conferences
- Church Retreats
- Reunions, Banquets
- Holiday Parties
- Weddings

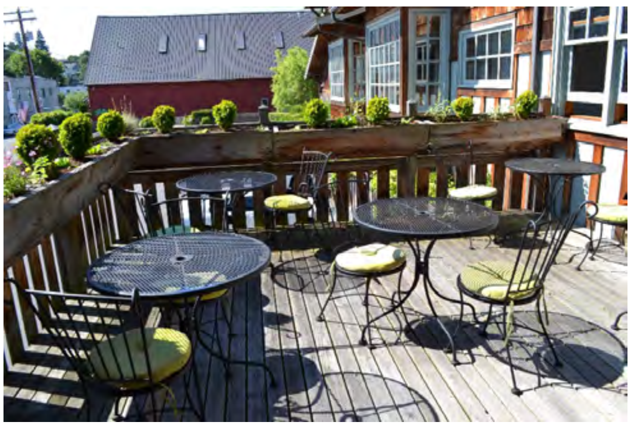
Meeting facilities	**Sq ft**	**People**
Dunlap Room – on-site	438	5-18
Two Forks – on-site	1,035	36-75
Vantage Room – Seafood & Prime Rib House Restaurant	1,200	99
Garden Club – historic building	1,471	100
Swinomish Yacht Club	15,200	200
Maple Hall – Town Facility	2,271	200-300

Conference Services/Equipment
- Easel: $10.00
- Flipchart Set: $35.00
- TV/VCR: $25.00
- White Board: $10.00
- Speaker Phone: $15.00
- Overhead Projector: $25.00
- LCD Projector (Sharp XR-10X): $50.00
- Screen: $15.00
- Speakers for a Laptop: $25.00
- Tabletop Podium: No Charge

Catering services - beverages
- Coffee-Air pots $15.00 ea.
- Sodas/Bottled Water $1.50 ea.
- Juices $2.00 ea

Catering services - snacks
- Assorted Pastries $18.00 per dozen





- Cookies $18.00 per dozen
- Fruit Tray $2.50 pp/day
- Chex Mix $1.50 pp/day
- Trail Mix $1.50 pp/day
- Peanuts $1.00 pp/day
- Chips $2.50 pp/day

Limited Continental Conference Room Breakfast

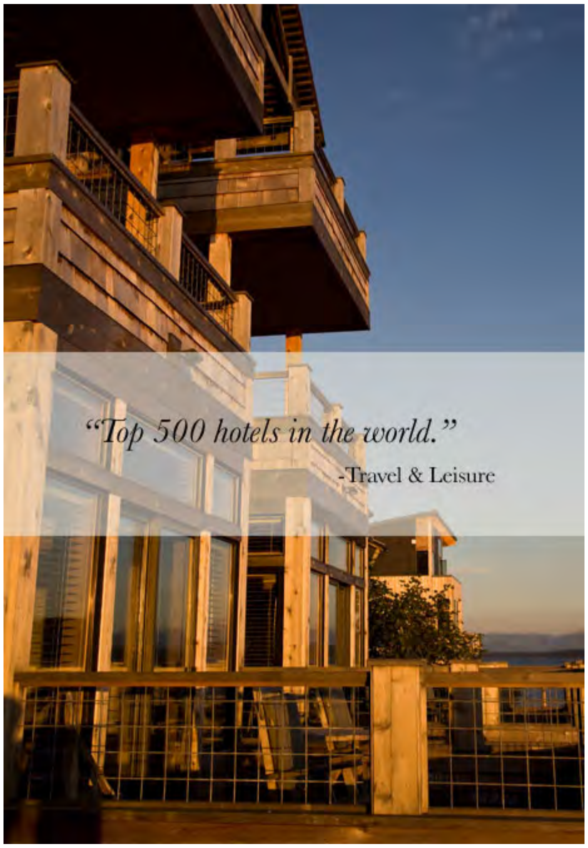
- $7.95 pp/day includes 3 Pastry Items, Hard-boiled Eggs, Granola, Yogurt, and a Fruit Tray.

Full Complimentary Continental Breakfast is included with the overnight stay in the Breakfast Room only.

Channel Lodge Accommodations

Captain's Suite – view with balcony
Queen Jacuzzi – non-view
Queen Jacuzzi – view with balcony
Queen Room – gas fireplace
Navigator Suite – families or couples
King Parlor Suite - view

www.laconnerlodging.com



Langley, Washington

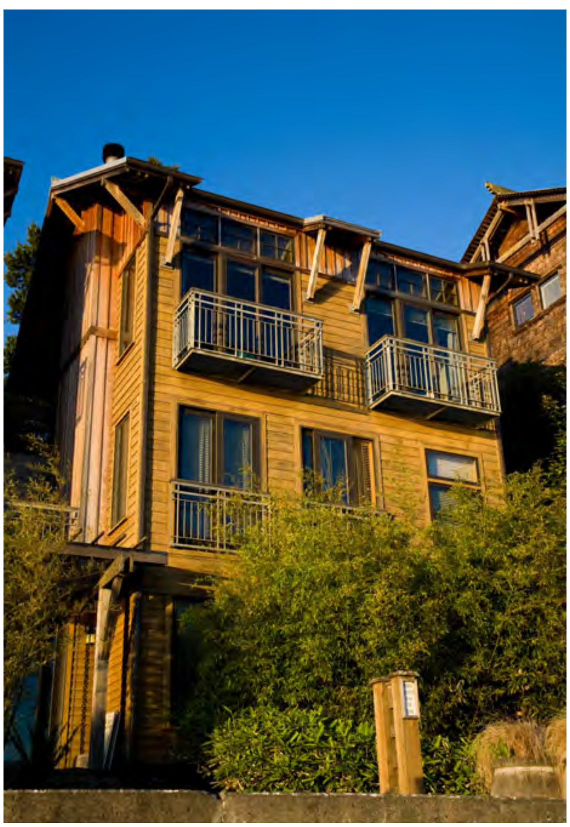
Inn at Langley

The Inn at Langley is located in downtown Langley, Whidbey Island, overlooking the Saratoga Passage with 28 rooms providing 180-degree views of coastal and mountains. Each room has a porch-style balcony, oversized jetted tub, and wood-burning fireplace.

- 28 guestrooms, suites, and cottages elegantly appointed with natural wood furnishings, in-room fireplaces, and oversized jetted tubs
- All rooms feature 180-degree view overlooking Saratoga Passage
- Complimentary, beyond-continental breakfast including fresh baked goods, local coffee, homemade granola and much more
- Exquisite multi-course dinner in the Inn's restaurant
- Extensive wine cellar
- Relaxing on-site spa
- Fully equipped meeting and event space for groups up to 20
- Customized catering menus including premier wine selections
- Beach access for strolling and treasure hunting
- Picnic to go basket for two with a bottle of wine and an Inn at Langley blanket
- Guests must be over 12 years of age.

Accommodations

- 16 guestrooms and 6 corner guestrooms each 400 square feet in size.
- 2 suites each over 600 square feet with separate entertaining and sleeping areas.
- 2 cottages sit on the bluff and feature two-stories, 940 square feet in size.
- 2 master suites, the Saratoga and the Gallery, are 1,500 square feet.
- Each guestroom features a 180-degree view of Saratoga Passage, and a large outdoor porch-style balcony.
- Each room includes a jetted tub and wood-burning fireplace.
- A queen bed with European down-filled duvet in the standard deluxe guestrooms or a king sized bed in the 6 corner guestrooms.
- Rooms 10 to 16 are two levels downstairs from street level, closest to the water with covered balconies.
- Rooms 20 to 26 are one level downstairs from street level with open balconies.
- Rooms 30 to 36 are level to the parking area at street level with covered balconies.



- Rooms 40 to 46 are one level up from street level and our highest floor.
- Note – there is no elevator at the Inn

Complimentary breakfasts are served in the Chef's Kitchen consisting of scones, toasted granola, muffins, quiches, organic yogurt, and local fruit. Multi-course meals are served in the Chef's Kitchen featuring local Whidbey fresh seasonal fare and wines.

On-site services include message and facials at The Spa. The Inn is in walking distance of Langley's bookstores, art galleries, specialty food shops, and unique boutiques.

In-room amenities include:

- Queen bed with European down-filled duvet
- Oversized jetted tub
- Fireplace
- Cable television
- Complimentary basic high-speed wireless Internet access
- Coffeemaker
- Refrigerator
- Bathrobes
- Hair dryers
- Iron and Ironing board

Meeting facilities include:

Outlook Room – can accommodate up to 20 attendees

Weddings

- Outdoor ceremonies in the Waterfront Boardwalk or Magical Cottage Garden
- Indoor ceremonies in the Sunset Room for up to 40 people
- Onsite catering for rehearsal dinner and wedding receptions
- On-site spa for pre and post wedding pampering
- Can arrange flowers, an officiant, music, cake, photographers

www.innatlangley.com

Port Townsend, Washington

Tides Inn

The Tides Inn is located at 1807 Water Street on the waterfront on Port Townsend Bay near the Ferry Terminal and historic downtown Port Townsend. Amenities include:

- Completely remodeled interior and exterior
- 780 foot beachfront access
- High Speed Internet
- 32” Flat Screen HD Televisions with Cable
- Complimentary breakfast
- Direct dial phones
- Non-smoking inside and out
- Close to Port Townsend – Keystone Ferry terminal
- Jacuzzi tub in most rooms, request upon reservation
- Kitchens in some units
- 2 pet rooms available, request upon reservation
- In room coffee
- Iron & ironing board
- Elevator access
- Meeting room
- Microwave & refrigerator
- Home style comforter
- Sit-down shower stall available in suites
- Guest laundry
- Picnic park

Rates:

4 November	28 February	$57	$194
1 March	23 May	$69	$222
24 May	12 October	$72	$287
13 October	2 November	$69	$222

www.tides-inn.com

Port Ludlow, Washington

The Inn at Port Ludlow

The Port Ludlow Inn is located at One Heron Road in Port Ludlow on the waterfront in the Port Ludlow Resort marina. The Inn has doubles, queens, and kings with partial to full views of the marina.

Meeting facilities

4 meeting rooms perfect for groups ranging from 2 to 50 with natural light, a covered veranda, and wireless service including:

- Olympic Room – 656 square feet with built-in white board/screen wall
- Andrews Suite – 562 square feet with conference table with sofas chairs arranged around a fireplace
- Olympic Room foyer – 360 square feet with access to both Olympic Room and Andrews Suite
- Heron Room – 420 square feet is in the main building with easy access to dining rooms

Dining areas:

2 dining areas for groups up to 50 with private dining rooms and banquet menus tailored to groups and dietary needs:

- Sun Room – 630 square feet with 270˚ view of Port Ludlow
- Marina Room – 756 square feet with sofa lounge section for pre- and post-dinner social time
- Outdoor entertaining – both the Sun and Marina Rooms lead out onto the covered veranda and front lawn area for outdoor entertainment.

Team building:

The Resort at Port Ludlow offers an array of individual and custom team building activities. Resort staff facilitates cooking-related events, classes, and competitions to meet group specific needs, interests, and goals. Kayak & Stand Up Paddle Board Rentals from one-hour or more test team building skills as well as take in the natural beauty of the area.

Executive retreats:

One to two-day retreats are available with food, golf, farm tours, and seaplane transportation from $350 per person.

www.portludlowresort.com

Gig Harbor, Washington

Maritime Inn

The Maritime Inn is located at 3212 Harborview Drive at the north end of Gig Harbor within walking distance of the historic downtown, award winning restaurants, diverse art galleries and shops, local pubs, bakeries, coffee shops, parks, public docks and private marinas.

Maritime Inn specializes in large parties for weddings, family reunions, anniversaries or business events with special rates for each.

Rooms are entirely smoke-free and offer free HBO, internet access, continental breakfast, with a handicap accessible room, and ample off street parking but no pets.

15 rooms have air-jetted tubs, fireplaces, high thread count Pima cotton bedding, elegant flooring, paint and tile plus in-room snacks and beverages and flat screen televisions. All rooms have water views and some have private decks with some located on the Boardwalk at street level, the main floor, or on the second floor ranging in price from $129 for a queen bed to $198 for a king bed with a private deck.

www.maritimeinn.com

Bainbridge Island, Washington

Eagle Harbor Inn

Eagle Harbor Inn is located a block from the water in downtown Bainbridge Island making it the most convenient inn on the island within walking distance between the inn and the ferry, a waterfront trail, a coffeehouse, a tavern and a marina.

The Eagle Harbor Inn is intimate and unique – a "petit hotel" with overnight accommodations in 5 one-of-a-kind hotel rooms and 3 custom townhomes in a one-of-a-kind luxurious contemporary island-cottage style built around a small, attractively landscaped courtyard.

All accommodations ($160-250) offer:
- Custom-designed furnishings
- Private, marble bathrooms
- Pacific Northwest art and artists
- Egyptian cotton sheets
- Fine and absorbent towels
- Flat screen TV and DVD players
- Satellite Direct TV with HBO
- Free high speed DSL
- Complimentary gym and health club services at Island Fitness
- Spa services at Renew
- Coffee service on site by Pegasus Coffee
- February Chocolates from Bon Bon
- Electric Boat Rental

3 townhouses ($375-525) available for short and long-term stays include:
- Premium accommodations on 2 levels
- Gourmet kitchen and dining designed to sit 8 or more
- Beautifully furnished living room with gas fireplace
- Direct TV and free wireless internet
- Private elevator from the garage
- Exclusive private garage parking
- Private elevator, within unit, from the garage and to all floors
- Private outdoor patio

No pets or smoking within the accommodations.

www.theeagleharborinn.com

Friday Harbor, Washington

Friday Harbor House

Friday Harbor House is located at 130 West Street overlooking the marina, ferry landing, San Juan Channel, and Mount Constitution on Orcas Island in historic downtown Friday Harbor, San Juan Island with endless outdoor activities available nearby including kayaking, golfing, whale watching, and more.

The 23 guestrooms most of which have views of include continental breakfast and wireless internet service with on-site and on-street parking. Each of the 23 guestrooms feature:

- Gas fireplace
- Oversized jetted tub-for-two
- Television
- Coffeemaker
- Refrigerator
- High-speed wireless internet access

Amenities include The Bluff Restaurant on the ground floor and terrace that offers seasonal fare from local waters and farms for meals and bar.

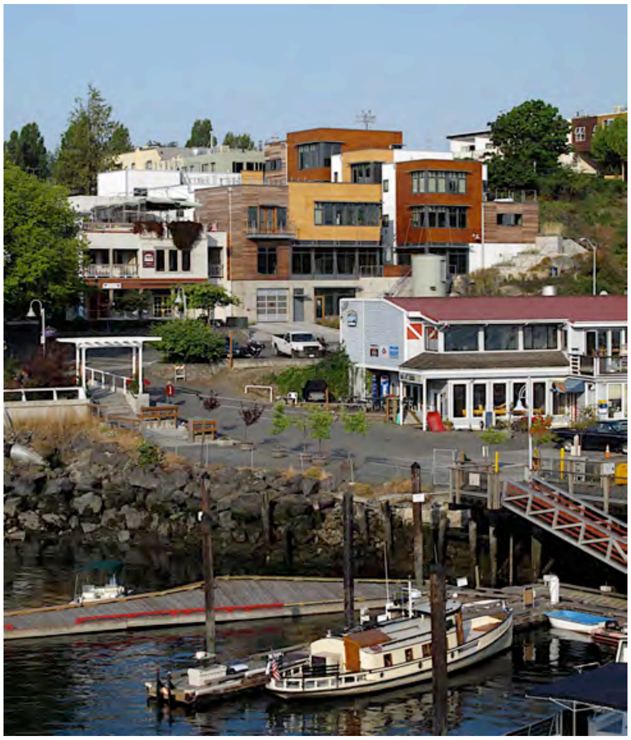
Weddings:
Guest services specialists are available to assist with reception menu selections, set up, and event coordination on the scenic bluff perched above the marina for up to 40 guests.

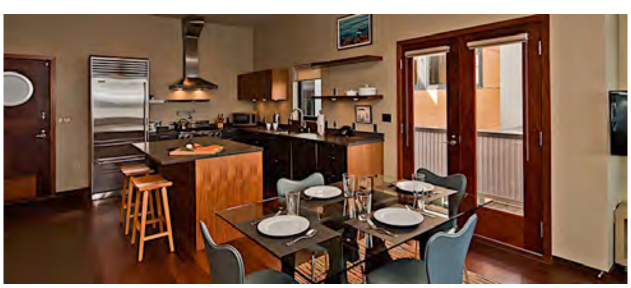
All wedding and receptions provide service staff, china and stemware. Other items such as: specialty linens, ceremony site chairs, chair covers, tenting, wedding arches, candelabras, floral arrangements and pedestals may be arranged for an additional fee. Beverage fees are based upon consumption. Both plated and buffet dining options are available.

Meetings and receptions:
The 1,070 square foot San Juan Room hosts up to 100 guests and provides for social events and meetings. Fully equipped with audiovisual equipment, the San Juan Room offers professional surroundings for company retreats including evening meals. Features include:

- Wireless Internet and the latest in audiovisual technology
- Plasma screen display
- A small outdoor garden

www.fridayharborhouse.com





Friday Harbor, Washington

Island Inn at 123 West

Island Inn is located at 123 West overlooking the marina and ferry landing in historic downtown Friday Harbor. The Inn is designed in a Euro-style with 15 different accommodations arrayed in stacked hillside structures.

The lowest level includes 4 Euro-style small no-view sleeping rooms for guests 16 and up. All units have access to a shared living space overlooking the harbor, marina, and ferry terminal. Euro-units 1, 2 & 3 are attached directly to the shared space that can be used for weddings, meetings, and social gatherings for groups of 20-30 people.

4 Euro-style rooms are 250 to 300 square feet no-view queen and king rooms with streamlined design and compact furnishings for guests 16 and older renting for $239 plus $15 for garage parking during summer season. Euro-rooms are furnished with flat screen TV, private Euro washroom, and a super large shower.

4 suites are four 35-490 square foot rooms with kings and some with a extra double bed, sitting areas, wet bar, mini-fridge, and one with private patio renting for $329 plus $15 for garage parking during summer season.

7 penthouses are located at the back and top of the Inn from 920 to 1,070 square feet with a kitchen, dining, living space, double queens, steam shower, a peek-a-boo view of the harbor, and access to a rooftop deck renting for $295 plus $15 for garage parking for 2-4 people during summer season or $295 with a puppy pass.

www.123west.com

Bend, Oregon

McMenamins Old St Francis School

McMenamins, an independent chain of brewery pubs and boutique hotels, transformed the Old St. Francis School located at 700 NW Bond Street in the center of historic downtown Bend from a 1936 Catholic schoolhouse into lively destination hotel complete with classrooms-turned-lodging rooms, a pub, brewery and bakery, a movie theater, private meeting and event space, and a soaking pool that serves day travelers, shoppers, hikers, skiers, and snowboarders alike.

The old school provides 19 guestrooms and 4 individual rental cottages with room for 2 to 10 people for group getaways. Old St. Francis School reopened in its current capacity in November 2004 and showcases the property's former life by featuring extensive artwork depicting the history of the school and the surrounding community.

Photos, memorabilia and students' artwork adorn the walls, making the boutique hotel a unique gallery of sorts including the colorful orbs that punctuate the high wooden fencing around the property, the unusual custom-made light fixtures, and tile mosaics that surround the soaking pool.

The guestrooms at Old St. Francis School feature televisions, telephones, free wifi and private bathrooms with showers. Overnight guests can also use the mosaic-tiled soaking pool. Occupancy for up to 4 people starts at $245.

Parish House - sleeps 6 to 10 people in a 2-story, 5-bedroom house that includes 4 queen beds, 1 bunk bed, 2 private bathrooms, television, telephone, refrigerator, coffee maker, microwave and free wifi.

Weddings, meetings, and special events

Old St Francis School facilities can accommodate up to 140 people including housing in the 4 cottages as well as indoor and outside banquets in the 4 types of on-site restaurants, bars, and cafes.

McMenamins has developed a chain of boutique hotels offering an eclectic mix of pubs, movie theaters, concert venues, spas, and events throughout Oregon and Washington since 1983 wherein they handcraft their own beer, wine, cider, spirits and coffee.

www.mcmenamins.com

Appendix C. Public Outreach Documentation

The information contained in this Appendix is organized in the following subsections:

MacLeod Reckord
Landscape Architecture ■ Planning ■ Urban Design
Journal of Commerce Building
83 Columbia Street Suite 306
Seattle, Washington 98104
P 206-323-7919
F 206-323-9242

Kingston Complete Streets

Meeting Notes
May 6, 2015
Consultant Attendees:
Connie Reckord, Jennifer Barnes, Marni Heffron, Pat Sloan,
Tatyana Vashchenko, Tom Beckwith; Consultant Team
Kingston Citizens Advisory Council

These notes contain the comments, questions and responses recorded by the project team during both the presentation and break-out session held at the public meeting. E-mailed and written comments submitted directly by respondents are attached, as are the open house sign-in sheets.

Purpose of meeting: Introduce to the public the purpose of the Kingston Complete Streets Study and Plan, its schedule and the analysis to date. Engage the public and advisory council in discussion and address questions/comment on the analysis, project priorities, and general issues as the design team prepares to advance the alternatives phase of the project.

Questions (Q)/Responses (R)/Comments (C) by Category:

General Questions/Comments:

Q: What is an example of a multimodal street? Doesn't Kingston already have each of those elements?
R: A multimodal street incorporates bike/pedestrian safety, transit and motorized traffic. Yes, those elements are sometimes present but not always in coordinated patterns that provide for connectivity and accommodate universal access.
Q: How did this project get started- what prompted and initiated it?
R: Greg Cioc- He applied for it three years ago as a part of a Transportation Alternatives Program grant.
Q: Does analysis end in May? If so, how will the peak season data (especially for parking) be gathered?
R: Jennifer Barnes – additional parking inventory will be done this summer and will include counts during typical peak season and during a special event.
Q: Is analysis taking into consideration the projected implications of the ferry reservation system.
R: Not at this time. Without definitive input from WSF on lane/ticketing requirements it is difficult to incorporate those needs.
C: Remember connectivity between upper and lower Kingston. A few community members are frustrated that the "outlying commercial" area seemed underrepresented in the presentation.

C: Make sure to work with Kingston stakeholders group to incorporate their work on branding and signage which will be key to improved wayfinding.

C: SR 104 is mislabeled as “Main Street”.

R: There seems to be some confusion among residents about SR104 also being called Main Street. Some have never heard it referred to as anything but SR 104.

Q: Should the project team be considering any projects within the holding lanes at the Ferry Terminal, as there could be potential jurisdictional issues of ownership.

R: That site has not been discussed to date as ideas have focused on the streets and gathering areas of Kingston. However that is not to say it would not be considered as it is a significant footprint that contributes to pollution.

C: At one point in the discussion it was stated that the Kingston ferry schedules are not coordinated with Sounder train schedules in Edmonds, but that is not correct, the ferry and commuter train schedules do coincide when everything is on schedule.

C: The project team needs to do more to incorporate the commercial area along SR104 into the study. Owner of framing business there feels there is an opportunity to provide a connection between this high use site and the gathering spaces of Village Green and Kola Kole Park. According to him there are already informal trails through the businesses on the south side that people are using to access those points.

C: Drop the effort for the Kingston foot ferry, move it to Suquamish where it is closer to the Seattle destination and closer to the Poulsbo population that would use it.

C: Off-road bike park is planned for a 200 acre parcel south of Port Gamble. This would be an important destination for out of town cyclists. Duthie Hill popularity was cited.

<u>Drainage:</u>

C: Analysis mapping should include Whisper Creek which flows west of Ohio.

Note: GIS Base information does not identify a creek that enters an enclosed drainage system from the ravine north/east of 4th Street aligned with Iowa Ave NE. Possibly named Whistler Creek. Project team will gather data.
According to a resident who lives in this vicinity, the soils in this same area around 4th Street are sandy and do allow for stormwater infiltration.

C: Catchment Area outfalls are not accurately reflected on the map.

R: Team will adjust areas according to information provided by the County.

Q: Do stormwater pollution issues on WSDOT leased property get considered in this project? Do those areas fall into the study area?

C: Resident from South of West Kingston would like to see storm water treatment in SW corner of Village Green. “Manchester II” designed to help improve storm water quality before it enters Appletree Cove. Resident is collaborating with experts from the County on daylighting the creek on her own property. Aware of an older storm water plan that prioritized improving storm water infrastructure South of West Kingston but it was sidelined.

Q: What happened to the storm water study conducted about four years ago?

R: Presumably referring to 2020 study? It identified more general than specific treatments. This project will advance the study that was started and identify some specific measures.

C: Basin D&E (Village Green) boundaries as shown in our catchment area slide/board are not accurate. Residents spoke of a historic creek named Kingston Creek on the site of the commercial area along SR 104 that has since been filled. This is presumably in addition to the creek identified on the maps. Team will conduct further investigation with County Stormwater to validate.

C: Ms. Bode who lives on the south side of W. Kingston Road also spoke of this historic creek and said that it is still an open creek on her property. The source of this is not clear but perhaps from subsurface flow daylighting on the water side of the road. Runoff drains across her property then west along the shoreline toward a sewer lift station located further west. Team will conduct further investigation.

Internal Notes: Tanya Issa lives on the south side of W. Kingston near Livingston Road where there has been anecdotal discussion of flooding and surcharging of drainage structures in the roadway. Neighbor has done work on their property which has led to more drainage coming into Issa property. They have been in contact with WDFW and the County and have expressed an interest in restoring the creek on their property as well as daylighting the creek on the Village Green property. She recommended talking to Chris May with whom she has already discussed the idea.

The idea of daylighting the creek in Village Green was also raised by an audience member during the presentation. Need to follow up with County Stormwater group on background.

Greg Cioc has relayed a conversation with other County personnel suggesting we look at diverting drainage in SR 104 to flow along 1st as opposed to Main Street. This would allow a greater catchment area to drain toward the Stormwater Park on the Port Property.

Traffic/Parking Planning:

C: All-way stop control should be considered at SR 104/Iowa Avenue – it would also help support traffic calming which is needed in that area.
C: Planning for the Kingston area should look further ahead than 20 years – should be more like 60 years – think BIG!
C: Traffic in area is greatly affected by ferry holding area management – a lot of data about this, and about traffic ferry surges, has been collected by Leonard Smith at WSF.
C: Traffic issues occur as far west as George's Corner (Miller Bay Road) during summer ferry surges. This project should articulate broader traffic issues in the Kingston area even if they occur outside of the study area and won't be addressed as part of the project.
C: Vehicle and non-motorized safety and circulation at the northwest end of the study area (west of Bannister St) is high priority, and needs as much attention as the area to the east of Bannister Street.

Pedestrians/Bicycles:

Q: Kingston has an impressive number of shoulders 4' or wider. Are those included in the bike lane analysis?
R: Shoulders are considered in the analysis, but not as designated bike lanes. These are considered bike routes or simply wide shoulders, depending on location.
Q: There is a new "active" group of tourists travelling to mountain bike. Are these being taken into consideration?
R: Yes, and tourism of all kinds is being considered in the study.

C: The focus should not be sidewalks in the "residential" zone so much as completing safe routes and bike lanes on routes to schools. We want non-motorized improvements out West Kingston and along Barber Cutoff to the Environmental Center and School. Several acknowledged the difficulty in widening the road section through Barber Cutoff – there are serious environmental and topographic constraints.
Internal note – consider incorporating a larger vicinity map showing connection to schools/other.
C: Safe passage across SR104 at Barber Cut Off Road is a significant concern even if it's outside the scope of the project – the skewed angle of the intersection makes pedestrian crossing particularly difficult.
Q: How is the project addressing the "invisible crosswalk" between intersections near the commercial center?

R: it was constructed a few weeks ago.

C: For bikes coming off the boat, it is a difficult 2 blocks from the ferry into town. This is an important route for connection to STO and Mosquito Fleet. Need to provide dedicated route/lane, clear up wayfinding, eliminate conflicts with cars and peds. May cyclists walk their bike down the ramp behind the WSDOT offices, through Port property to get to West Kingston and other points west.
C: Safe Routes to Schools funding for more walkways/intersection improvements is not supported by the School District because it reduces funds for busing. Basic problem with getting the SD on board with providing SRTS.

Multiple residents expressed the importance of providing sidewalks and connections to schools. The "bowl area" (currently residential) is less of a concern in their minds. The bowl area was presumably the residential area north and east of 1st Street.

<u>Washington Boulevard:</u>

C: Resident expresses concerns about pedestrian lighting along Washington Blvd. Concerned that it will be expensive with very little return and will add to light pollution. What standards are prompting the decision to include this lighting?

R: Providing lighted connections into the residential areas improves safety and has been requested by some in the community.

C: The final Washington Blvd. solution should not include a two way street – leave it as a one-way street.
C: If the bluff is eroding, why invest in infrastructure atop it?

R: The addition of stormwater collection/diversion may reduce erosion.

C: It is not clear what benefit the proposed improvement of Washington Boulevard would have for businesses on Main Street. Concern was stated that it would serve to draw or keep people away from businesses to the west.

<u>Economic Development:</u>

C: The blue bubble designating the "residential" area on the Destinations map is misleading because the area is zoned mixed use/commercial and should continue to develop as such.
Q: Why are parks and parking being identified as underutilized?

R: consider differentiating the colors shown between underdeveloped/underutilized parks and the rest of the parcels shown. Tom Beckwith further elaborated that it doesn't mean these properties are targeted for development.

Q: Is economic development analysis taking into account the Arborwood build-out?

R: Expanding population in the immediate vicinity is taken into account, whether from Arborwood or other nearby developments. It is factored in as an estimated percentage increase of the existing population.

C: The "outlying commercial" area is actually where the majority of merchants are located. Need more connectivity to that commercial area. The presentation does not dedicate enough attention to that area.

KCAC – Collected Public Comment from May 06, 2015 Meeting

Collection of comments on "Complete Streets", "TIP", & "Washington Street Upgrade"

1.From: Maxine Healy <mraehealy@gmail.com>

Date: May 8, 2015 8:45:06 AM PDT

Hi Mary, thanks for asking. Norma and I arrived about 5 minutes late so perhaps I missed a good explanatory introduction. Although they were all introduced my first reaction was "who ARE all these people and what are their goals for the community, parking, better traffic in and out, better business??? They covered too many subjects in a scattered matter. The lead speaker on your side of the room was very poor, should have had a microphone, seemed to resent questions. I don't think Norma was able to either see or hear much. I am sorry we had to leave early because I no longer drive after dark. The question and small group presentations were probably much more informative. My over all feeling was" the money is availabe, let's see how we can spend it". I do agree our traffic pattern needs help and the businesses need help.! I will be talking to some others this weekend and if I get any feedback I will let you know. Maxine

2.From: Rick Feeney

Kitsap County resident (Port Orchard)

West Sound Cycling Club, Advocacy Board Member & 2013 President

www.westsoundcycling.com &

WABikes, Statewide and Legislative Issues Committee, member

PSNS&IMF, Department Safety Advocate

Subj: A Cyclist's Complete Streets Comments

Thank you very much for the opportunity to attend the meeting on 6May2015 on your Complete Streets initiative. It was very informative and the effort is highly admirable for its bicycling, pedestrian, & ecology/environmental efforts being considered. It will be very important to Kitsap County as the first community in this county to get this praised accreditation. It will help set a lofty goal for the rest of the communities and rural areas working on similar initiatives.

I attended as a member of the West Sound Cycling Club (WSCC). We represent bicyclists though out the Kitsap Peninsula. I am a Past President and current board member for the purpose of Bicycle and Pedestrian advocacy. Of note is that, WSCC, last summer in our annual Tour de Kitsap bicycle ride (last Sunday in July), initiated our first start/finish/rest site at the Village Green park. Thus we had approximately 300 riders venturing into your community. We estimate about 40 came in on the Edmonds ferry. Kingston is also a site for many of our club rides.

As I indicated at the meeting, I did perform a ride around most of the thoroughfares in your community before the meeting. The following are what I observed.

1. I am very impressed with the wide shoulders throughout the Kingston Community area.
2. There is a lot of loose "winter" gravel on the west bound shoulder heading out of town to Miller Bay Rd. Recommend this get swept as soon as practical. It can give a negative image to a cyclist visiting the area.

3. There is no virtually no shoulder (either direction) on Miller Bay Road from the four corners intersection to West Kingston Rd (and beyond to Indianola/Poulsbo). This is a relatively high traffic road at 35/45? mph. This would connect the wonderful bike lanes on West Kingston Rd to the nice shoulders on Hansville Highway. This matters more as Kitsap County is in process of completing paved of 4'+ shoulders on the Hansville Highway out to Hansville. This would establish a safer route into and out of Kingston.

4. To really "establish" the Complete Streets, I would saturate all of those wide 4'+ shoulders on the thoroughfare lanes throughout the Kingston area with Bike Route signs and Bike Lane icons painted on the street, 6" fog lines on high occupancy roads, etc. It would really drive home the message.

5. The highway has a couple of "exits at speed" intersections (e.g., Barber Cutoff). You might want to consider the new trend to paint green bicycle lanes at these locations to show motorists where that cyclist coming toward the intersection is likely going.

6. I strongly recommend that the Barber Cut Off Rd receive 4'+ shoulders on both sides of the road (or created a paved Shared Path). This is a highly used pedestrian and bicycling road on a busy road. This is also one where the bike lane on the south side could receive a 6" fog line.

7. I would be a plus if there were a permanent restroom installed at the Village Green park. This is where I parked for my ride and I had to change into my bicycle clothes in a Port-a-potty. It is also the start/end point for our Tour de Kitsap routes in Kingston. Virtually all riders hit the restroom before heading out of the stop and manning it up with the portable restrooms is a noticeable cost we incurred there at TDK.

8. In the highway going into town, it would be beneficial to direct bikes (with a sign) the back ways into town when there is ferry lines on the shoulder. Or maybe put Sharrows in the lane.

Please feel free to contact any of the board members on our website www.westsoundcycling.com to assist you in recommendations, mapping, etc. We have a strong advocacy group that are there to help.

V/R,

Rick Feeney

360-731-9609

3.From: Nancy L.

All - I trust that Greg and the consultants were taking good notes on the public comment. Two concerns that I heard discussed further after the meeting were:
1. To date the analysis has focused more on the 3 blocks close to the ferry with little attention given to the area further up SR 104 and hopes that more attention will be given to the "uptown" area and being sure that they are well connected.
2. Although the Washington Blvd is only a pilot project, there were questions and concerns about why it is the first project and what benefits will accrue. I think additional discussion about how this catalyzes effort in the greater picture and how it benefits the whole UGA would be helpful in future meetings.

One observation on my part was that it appears that we don't have a lot of physical barriers to implementation, e.g. topography issues, environmental issues, etc. Most of our barriers are in the process, e.g. government agencies working together, financial resources, etc.

4.From: Dennis H.

Heard: Please make sure "Upper" & "Lower" Kingston are well connected and develop together and not separately.

Return form to Greg Cioc,
Kitsap County Public Works,
gcioc@co.kitsap.wa.us or
614 Division St. MS-26
Port Orchard, WA 98366
Questions? 360-337-5777

COMMENT FORM Betsy Cooper

Kingston Complete Streets

May 6, 2015 Public Meeting

Please provide comments/information to assist in the planning and design process. If you have questions, please provide contact information for a response.

* Economic Analysis appears to be omitting the major commercially zoned Area - the Undeveloped Area Analysis should be revised and build out should be considered.
* ? Sounder - Commuters ARE using Sounder, it is timed for major Commuter times =
* Outdoor activity tourism should be consider in Analysis, and should considered
* Walking pedestrian analysis showed the "Blue area" as residential only. While there is the hope for redevelopment in this UVC area as high density residential. But also there will/should be significant commercial in this area as well
* timeframe of study needs to be clarified and ~~to assess~~ the time horizon of the potential changes should be considered. Particularly since the major 104 modification will be in a Long term consideration by 2015-2025 will represent an important 1st Phase for Kingston where traffic and parking, and multimodal options might be different from 2025-2040 35
* Economic Development analysis should extend to the rest of UVC which appears to be artificially left out of study area.

⟹

* Important to (as part of Washington Blvd Corridor) to get the Bus access back on to the ferry Landing (want to support this as described by Greg.) It is a major issue for accessibility.

* Barber Cuttoff Road - seperation pedestrian shoulder from road way traffic at Least on one side of the road.

KINGSTON COMPLETE STREETS OVERVIEW

Kingston Citizens Advisory Council Meeting, May 6, NKF&R Paul Nichol Headquarters Station

NAME	ORGANIZATION (if applicable)	E-MAIL
STAN MACK		mackstanleyj@gmail.com
Kristine Libby		kristinelibby@mac.com
Walt Elliott	~~Port of Kingston~~ KCAC PTOS Ferry Advisory Comm	elliottmoore@comcast.net
Tania ISSA		theissafamily@gmail.com
Don Willott	North Kitsap Trail Assy	dwillott6mac.com
Darren Gurnee	Main St. Ale House	dgurnee@tazsolutions.com
IK ICARD		ikicard12@gmail.com
NANCY TIETJE	KCAC - SORT OF	cpp27604@centurytel.net
DON HUTCHINS	KCAC - KNK ROTARY REP	DBHUTCHINS@COMCAST.NET
Betsy Cooper		betsycooper1@gmail.com
Mary Gleysteen	KCAC Friends of Library	marygleysteen@gmail.com
Dennis Hedlund	KCAC chair	
Steve Heacock	KCAC	
Dave Wetter	KCAC-Village Green Foundation	
Mark Libby	KCAC-Parks & Trails	
Nancy Langwith	KCAC-economic development	

KINGSTON COMPLETE STREETS OVERVIEW

Kingston Citizens Advisory Council Meeting, May 6, NKF&R Paul Nichol Headquarters Station

NAME	ORGANIZATION (if applicable)	E-MAIL
Deborah MacKinnon	Kingston Rotary	demackinnon@hotmail.com
Rick Feeney	West Sound Cycling Club	rfeeney@wavecable.com
Kathryn Thompson	KC Parks Board Advisory	Kathryn078@icloud.com
DAN MARTIN	Rotary-Chamber-Stakeholders	DanMartin@msc.com
Johnny WALKER	AC Frame & Fine Art	almostcandid@me.com
SHANNON CASTILLO	THISTLE FLORAL & HOME	flowers@thistlefloralandhome.com
WILD CASTILLO	"	
Betsy Tarpley	KCAC	Betsy.tarpley2@gmail.com
Dorothy & Linn Harris		linndot@aol.com
Ron & Jeannine Karzman		
Gale Kirsopp		
EVAN STOLL		stolle@comcast.net
MARILYN BODE		lidenbode@aol.com
Jerry Kirschner	GKEDC	
MaryAnn Hallen	KCAC	
Bruce MacIntyre	POK	~~BF~~ BruceM@PortofKingston.org

KINGSTON COMPLETE STREETS OVERVIEW

Kingston Citizens Advisory Council Meeting, May 6, NKF&R Paul Nichol Headquarters Station

NAME	ORGANIZATION (if applicable)	E-MAIL
Greg Cioc	Kitsap Co PW	
Kathleen & Glenn Wooten		gawooten@comcast.net
Rebecca Pirtle	Kitsap Co. Commissioners	rpirtle@co.kitsap.wa.us
Glenn Malin	KCAC Kiwanis	
David Malone	KCAC-Pt. of Kingston	
Chris Placentia	KCAC-S'Klallam Tribe	

MacLeod Reckord
Landscape Architecture ■ Planning ■ Urban Design
110 Prefontaine Place South, Suite 600
Seattle, Washington 98104
P 206-323-7919
F 206-323-9242

Kingston Complete Streets

Meeting Notes
September 15, 2015
Consultant Attendees:
Connie Reckord, Jennifer Barnes, Pat Sloan,
Tatyana Vashchenko, Terry Reckord; Consultant Team

These notes contain the comments, questions and responses recorded by the project team during both the presentation and break-out session held at the public meeting. E-mailed and written comments submitted directly by respondents are attached, as are the open house sign-in sheets.

Purpose of meeting: Present to the public the range of improvements possible in Kingston. The options presented were developed using analysis and public feedback gathered in the previous phase of the project, and at the public meeting on May 6, 2015. Engage the public in discussion and address questions/comment on the street typologies, street and intersection options, project priorities, and general issues as the design team prepares to finalize recommendations during the next phase of the project.

Questions (Q) / Responses (R) / Comments (C) by Category:

General Questions/Comments:

Q: Will the presentation materials and PowerPoint be available online?
R, *County*: Yes, Rebecca Pirtle, Kitsap County Communications Coordinator, will be posting presentation materials online.

Q: The improvements the team is describing are great but will residents ever see any of these projects get built? So many small fixes can be made. The team did a good job analyzing and developing options but what will come of it in the short run? For what time scale are these projects designed?
R, *MR*: *Projects* will have a wide range of sizes and cost, improving chances to see implementation. Greg Cioc, Kitsap County Project Manager, explained from the County's perspective how projects are selected and funded, and what funds were likely available in the coming years. There is not a defined schedule for completion of these projects.

Q: Is the consultant team looking to the sub-area plan to make sure our project recommendations fit well into larger planning efforts?
R, County: The comprehensive plan is currently being updated and will be finalized soon. The sub area plan is also being revised, a draft is available now and the team will review draft recommendations with these project recommendations.

C: Evaluation criteria should include health/fitness.

Q: What is the difference between Active Shared-Use Major and Shared-Use Minor street typologies?

R, *MR*: Primarily level of current use by pedestrians/cyclists, density of business, and existing streetscape character.

Q: Funding is often a major issue. What are the avenues for the recommended projects coming from this study to get funding?

R, *County*: There is a new funding cycle commencing soon, however some projects may be good candidates for the various kinds of transportation funding that is periodically available. The final report will include some specific funding recommendations.

Q: What is the "stakeholder committee" mentioned in the meeting itinerary?

R, *MR*: The group was selected by the County for this project in particular, and includes residents, Port staff, business owners, community committee members, etc. Several stakeholder committee members identified their presence, and explained the difference between this group and the ad hoc Kingston stakeholder group the questioner was familiar with.

Q: Once the 50 or so recommended projects are identified, how will the funding be pursued? Is there a funding bucket? The community will need help from the County to prioritize which project will happen when.

R, *County*: See response above regarding funding sources. Regarding prioritization, review and provide any input on the draft evaluation criteria presented. That is how the community can have the greatest influence on project priorities.

C: There's a science and art to matching projects to funding sources. How can we do so effectively?

R, *County*: The County will help do that.

C: Need more lights on Main St. north of Ohio.

C: Bollard lighting is desirable on Washington Boulevard, as long as lighting can be kept low level and without glare.

C: Let's DO something, enough planning.

<u>Drainage:</u>

C: *Ms. Marilyn Bode* provided description of runoff issues on her parcel:

- Ditch/creek on top of sewer line on east property line.
- Catch basin in street – rim may be set too high and drainage will not flow in.
- Karzmark is the neighbor to the east and suffers from the same flooding issue.
- Discussed concept of diverting runoff from Bannister to the east to alleviate flooding if capacity is the issue but that is not necessarily the case.

R, *KPFF*: Will follow up with site visit.

C: *Port Commissioner* recommended looking into installing some treatment system beneath the holding lanes. Has the team talked to WSDOT about such an idea? The area adjacent to the proposed park is not feasible because of the Ferry's infrastructure.

R, *KPFF*: A significant portion of the runoff drains toward the holding lane area so it would seem like a logical location. The team has not yet discussed idea with WSDOT.

C: *A. Nelson:* Team should look into the feasibility of putting something beneath Washington Boulevard. A sand filter vault perhaps or even a proprietary system beneath the roadway. This could be incorporated into the STP-funded project.

C: *Lena Parks*: her property suffers from severe winter flooding with 4-6 (surrounding) home affected.

R, *KPFF*: Technically this area is beyond the study limits but offered to look into the matter to see if there is something that could be done.

<u>Transit:</u>

Q: How many people are using transit to get to the ferry terminal? Are these people being considered in the study?

R, *MR*: Transit counts have not been provided. Yes, transit users are being considered in the study. There are some ferry access related challenges dictating the current location of the transit stop which is located a block and a half from the ferry ramp. MR has been in dialogue with Kitsap Transit to understand all the issues that prompted the relocation of the transit away from the terminal and to find a way to bring it closer to the ferry. Shifting ferry ingress and egress to 1^{st} street leaves more ROW on Main to allow for transit, bikes and pedestrians to access the ferry more directly.

<u>Traffic/Parking Planning:</u>

C/Q: Half of the downtown business owners worry that shifting ferry access "out of town" would take business away, the other half of business owners think the opposite. What is the consultant's perspective?

R, *MR*: There are a number of factors that contribute to changes in volume for businesses, and this study doesn't purport to investigate what effect a shift in ferry loading/unloading would have on local businesses. Members of the design team have range of opinions on the matter.

Q: Will the team be making a recommendation about whether or not to shift the ferry traffic to 1^{st}?

R, *MR*: No. Both options will be kept in mind for the Complete Streets projects.

Q: Will the team be making a recommendation for a preferred intersection option, given a shift in ferry traffic?

R, *MR and Heffron*: Yes. Based on operational analysis and urban design criteria, the team will make a recommendation for a preferred solution. From an urban design standpoint, roundabouts are not pedestrian and bicyclist friendly. From an operational standpoint, there are challenges in properly managing ferry traffic in the roundabout.

C: Given a shift of ferry traffic from Main to First Street, widen the center area of Main Street for shared seating, reduce Main Street to two lanes going in both directions, and eliminate parking on Main. A similar street configuration exists in Italy where waiters cross the road to serve their customers seated in the median. Hydraulic bollards could control traffic, as in Italy.

C: Parking on West Kingston is a safety issue during big events at the Village Green.

C: Consider WSDOT parking lot change to ferry vehicle holding lot, especially to accommodate the reservation system. Traffic should address what changes in the signalization system would be necessary if reservation traffic queuing was in the WSDOT lot.

C: Reservation system and/or greater use of technology needed to control traffic. Reservation system will however further limit business interest in downtown.

C: There exists an immediate issue with vehicles exiting ferry and illegally turning left on Washington Boulevard- need a sign!

C: Immediate improvement would be to paint "Do Not Block" at the 1st St. intersections.

C: Move ferry worker parking to WSDOT lot to increase holding lane capacity.

C: Other things could also be moved out of holding area.

C: In the Signal Option map, the Left Turn Only lane linking Northbound traffic from Main Street to SR 104 is a good feature for bikes to cross and continue on 104.

C: Would like to see "Do Not Block" striping at Ohio and NE 1st St. Would like a signal at this intersection.

C: People merge early along NE 1st St between Washington and Ohio. This messes up traffic flow.

C: Would prefer to keep road segment between NE W Kingston Road and Iowa Ave. open in Signal Option.

C: We need more ferry queuing space downtown to allow those waiting (longer than 1 boat) to take advantage of downtown businesses.

C: I agree with removing parallel parking on Main.

C: Extend the 4 lanes of off-loading ferry traffic further up SR 104 before transitioning to 2 lanes. This would get the cars out of town faster.

C: Parking control needed on Washington Boulevard north of 1st – that will help limit access.

Pedestrians/Bicycles:

C: Something that was mentioned in the last public meeting but has been left out of this presentation is a defined tourism route/circuit linking the waterfront to the Kingston core.

R, *MR*: The shoreline trail/upland loop has not been forgotten, but due to Port ownership and control of land-use, has not been shown as a project in this study. Other challenges will be coordination of the route with WSF. It will definitely be a recommendation in the final report, but may not have the same 'standing' as projects that can be accomplished in the public ROW.

C: Bulb-outs can be a major obstacle to bicyclists. In Poulsbo, newly installed bulb-outs created a hazard for cyclists who were forced to merge with traffic to avoid them. Consequently, they were removed shortly after installation.

R, *MR*: There are situations in which bulb-outs are an appropriate solution, however, when there is limited ROW and a safe bicyclist route cannot be established, they should not be designed to obstruct or interrupt a bike route.

Q: Does this project look at vehicular speed limits to see if there are any improvements that can be made to make streets more pedestrian and bike friendly?

R, *Heffron*: conducted a 1.5 week ferry surge count in peak season and requested speed data. They will be analyzing the data in the coming project phase.

R, *MR*: street calming efforts such as street tree planting, enhanced pedestrian space, and more prominent cyclist presence in the street all function to slow traffic as well.

Q: Is team making use of recent speed limit reduction from 25 mph to 20 mph in Kingston?

R: Unclear on what the question is asking.

Q: How does this project acknowledge and respond to the Sound to Olympics Trail and Mosquito Fleet Trail planning efforts? There are many people who would like to ride their bikes but don't due to safety concerns. Would like to emphasize that plans like the STO provide those cyclists safe routes.

R, *MR*: Routing for these popular regional trails is considered in the planning of facility types on the two corridors that are identified as connectors (NE W Kingston Road and SR 104). Final recommendations on facility type will be made in the next phase of this project.

C: Main Street Option A section shows a sharrow behind front-in angled parking. This configuration could be unsafe for cyclists behind parked cars backing into the shared lane. This option shouldn't be considered. There is an example of a similar problem between angled parking and cyclists in a recently built project in Manchester.

C: Several cyclists voiced a strong preference for a Main Street without street parking.

Q: Does a shared-use path have a place along Main Street? Need to make sure that families with kids on bikes have a safe path to travel. A shared-use path may be a good facility for them.

R, *MR*: Depending on available width, a shared use path may or may not be the best solution. A formal shared use path is typically not a good mix with retail, especially when business are encouraged to expand (dining/carts/tables/etc) onto the sidewalk.

C: Would like to see the Kingston Complete Streets project recommend a cyclist route from the ferry that would bring cyclists into the future STO shared use path on NE West Kingston Road. There should also be a safe route linking cyclists on SR 104 to the ferry terminal and vice-versa.

C: Cyclists should not be routed into off-loading ferry traffic. Trucks and higher travel speeds make it unsafe for cyclists.

Q: How can walk-on and cycling tourists be drawn into town? What can we do to proactively keep tourists in town?

R, *MR*: Improving bicycle and pedestrian facilities in many of the ways mentioned earlier – improving accessibility and connectivity, finding/making the space for dedicated facilities (bike lanes, wide sidewalks, etc.), and continuing to develop businesses that are shown in the model to be missing from this downtown core (refer to earlier presentation to economic development group).

C: Build sidewalks in residential neighborhood. Don't wait for redevelopment.

C: 4th Street should serve as a multi-purpose trail with emergency access.

C: Show future STO Trail along NE West Kingston Road.

C: Sidewalks and bike path are needed on 2nd Ave.

C: On Ohio Ave. NE, need sidewalks going up the hill.

C: Bicyclists going north on Main Street, need a good way to turn left onto NE West Kingston Road.

C: It's really hard for pedestrians to cross exiting ferry traffic on SR 104.

Washington Boulevard:

C: Want to see a plaza, perhaps with some retail on the SW corner of the Main/Washington Blvd intersection. A plaza at that corner of the Port property would make the Kingston Downtown more visible and would bring visitors from the waterfront towards town.

C: Washington Boulevard Park should/should not have a structure (multiple opinions).

C: Connect community up East Ohio to the community there.

Economic Development:

C: The primary reason for business failure/businesses leaving the core is because rental rates are too high.

C: Businesses don't want to set up in Kingston due to the ferry traffic – it is a "cultural attitude" that no one wants to deal with the ferry surges, traffic, disruption.

C: Some advice/recommendations: Shops should stay open past 5 pm! Kingston needs some high end restaurants. Kingston Inn was so successful, can it be duplicated? Try more, and higher end delivery food service. How about a pharmacy/drug store or a specialty grocer that's not a chain in downtown?

COMMENT FORM

Kingston Complete Streets

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The ferry traffic on 104 is a huge problem for anyone who lives in Kingston. Coming downtown on weekends in the summer is impossible. In addition the cars have to be moved through town as ferry fills up preventing drivers and passengers from visiting businesses. a parking lot for holding cars on a reservation system is crucial to the economic development of Kingston. all the pedestrian friendly, improvements planned along with parking will be ignored if people can't get out of their cars. It is an issue that seems to be falling between the cracks probably because it involves WA State Ferry. Please look at the ferry holding parking lot as an important part of this overall project.

Thank you Rita Oslvin

There is a Parking lot between Ohio & Iowa already owned by the DOT.

Return form to: Greg Cioc,
Kitsap County Public Works,
gcioc@co.kitsap.wa.us
614 Division St. MS-26
Port Orchard, WA 98366
Questions? 360-337-5777

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Kingston has a MAINE STREET (Not a MAIN ST.)
But 104 is not it

Should have Alternative & Neighborhood Streets
on 3rd (Extend to West)
on 4th - Paved MultiUse & Emergency
on Iowa - extend to 4th
with Sidewalks for each

Street Plan should incorporate Sub Area
Comp Plan points - especially Appendix E

NEED Specific Numbers for Ferry traffic
Increase over next 10, 20 & 30 years
And measures to accomodate Autos
(ie WASHington Ave will become Ferry PARKing)

Public Bathrooms needed ~~also~~ for those
waiting on Hwy 104

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(1) Routing bike egress from ferry: like the idea of moving bike egress from/to ferry to Main St and diverting cars ferry traffic to First Ave. Car traffic on Main would be local traffic only. Would eliminate on street parking near ferry and create pedestrian blvd (with bike access). Kingston has luxury of underutilized parking so shift parking on Main to underutilized lots and improve the desirability of the business area. See economic benefit with this option (1) See below footnote

(2) Like the option of a signal where Main & First come together - better for bikes to cross to right side & continue up 104. A traffic circle would be very dangerous for bikes and is not a good option

(3) Add economic impact to your criteria so there is a more direct link between project options & economic vitality.

(4) Lowering posted speed results in more shared use because it is safer. If car ferry traffic is diverted to First, then the posted speed along Main should be slow - 15 or 20 to allow peds, bikes & local traffic to share the area enjoyably.

Footnote (1) Separating cars from bikes for on/off ferry allows bikes to turn left to NE W. Kingston w/o dealing w/ ferry traffic

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1) study & info Needed: would a Re-Route of Ferry traffic out of Downtown Kill Kingston Business Or Be A Boom for them?

2) Short-term, Cheap Fix: "Do Not Stop in intersection" Signs on every cross street like Ohio Ave. If we don't ask Ferry traffic to stay out of the intersections why are we surprized when they Block them?

3) If we want People to Get out of their parked Ferry dock cars, Put up A Big Sign that Reads "Your car will not be moving for 23 minutes" for 22 minutes, for 21 minutes That will let people wander and not worry about ferry loading time

Bim

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Kitsap County Public Works,
gcioc@co.kitsap.wa.us
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It would be nice to have some implementation someday. Every 2-3 years there is a community meeting with elaborate displays but nothing ever gets done. (except volunteer projects!)

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no roundabout –

⇒ divides up + down town!

probably won't ~~wont~~ work w/ traffic lights

upstream –

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Roundabout vs Signal

Roundabout aesthetically pleasing but,

1.) Divides uptown from downtown

2.) Too large for area

3.) Will it work w/ heavy traffic
Oftentimes the State Police are not managing the traffic.

4.) would be better placed at Lindvog

Parking

Simple, no cost, no loss to Port
change:

Change parking along Washington
in front of Drifters → Yacht Club
to Free 2 hour parking and
move Commuters to parking
lot below.

Simple 1 for 1 exchange.

COMMENTS

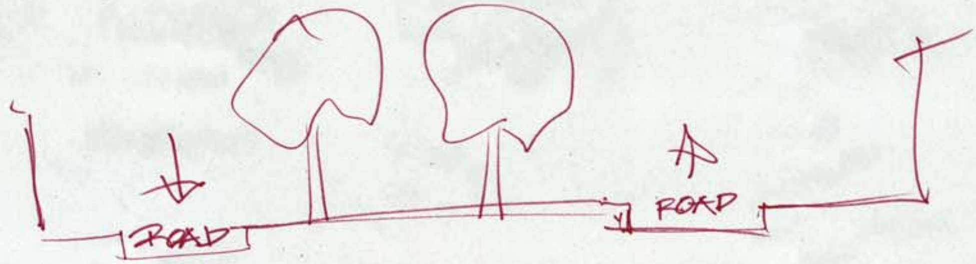
- Move ferry worker parking to WSDOT lot to increase holding lane capacity.
- Other things could also be moved out of holding area

COMMENTS

- Parking on W. Kingston is an issue (safety) during big events at the Village Green.
- Consider WSDOT parking lot change to ferry vehicle holding lot.
- Build sidewalks in residential neighborhood don't wait for redevelopment
- (Immediate issue w/ vehicles exiting ferry illegally turning left on Wash Blvd - need sign!
- Immediate improvement would be painting "Do Not Block" at 1st St intersection

COMMENTS

WIDEN THE CENTER AREA
FOR SHARED SEATING



 & THAT GO UP & DOWN TO
LET TRAFFIC GO THROUGH OR NOT
(LIKE IN ITALY)

Kingston Complete Streets: Comments on the Open House

By T. Keith Gurnee

After attending the September 15, 2015 Open House and Design Charrette on the Kingston Complete Streets project, I offer the following points in response to the consultant's request for comments:

1. **The Process:** This public meeting was not a true "design charrette". It was more of a public presentation of alternatives with a limited priority setting exercise. While the session was helpful to see broad range of graphics prepared by the consulting team, I was expecting to participate in a more interactive exercise. A true "design charrette" is a facilitated design brainstorming workshop wherein maps are provided on tables and workshop attendees are challenged to work together to graphically depict their own design ideas within a specified time limit. As someone who has been in the design and planning field for over 35 years and who has facilitated hundreds of such sessions, they are incredibly important to gauge how a community perceives itself and to inform the consultants about local wants and desires. The consultants can then go on to develop design alternatives and to test those alternatives at a subsequent workshop. While I had hoped that the process could have been conducted in this manner to truly engage the public in the design process itself, there was still some valuable information provided by the County's consultants that could be used in resolving the scope and scale of the improvements to Kingston's circulation infrastructure.
2. **First Street Alternatives:** There were two main questions that remain to be resolved: (1) whether or not First Street will be converted into a road that will provide ingress and egress for ferry traffic, and (2) whether or not the intersection of First Street with Highway 104 will be the focus of a new traffic signal or a roundabout. My points would be these:
   - Should First St. become the route for all ferry traffic, about an additional 20 feet of right-of-way would need to be acquired to accommodate four lanes of traffic, bike lanes, and pedestrian sidewalks. This is likely to be an expensive undertaking while taking years if not decades to be realized. Nonetheless, I feel it is the most functional way to go, provided that when it actually happens that improvements to the Highway 104 corridor through downtown per Option C are made simultaneously with the improvements to First St.
   - If First Street is converted into handling all ferry traffic and the improvements to downtown Kingston are **<u>not</u>** made, then First St. will become the focus of new commercial development while the existing downtown dies. While this strategy would likely increase the cost of converting First Street, it is essential to protect and revitalize the existing downtown to make it a destination and preserve its economic viability. Unless the improvements to downtown Kingston are done at the same time as the improvements to First St., the conversion of First St. as the ingress and egress for ferry traffic would be a bad idea.
   - While I have long favored roundabouts, I don't think it will work as the connection between First Street and Highway 104. It looks like it would have to be shoehorned into the urban fabric of Kingston. While I was informed that it would work based on traffic modeling, I find it hard to believe that two lanes of traffic coming out of the ferry being forced to merge before getting to the roundabout will only exacerbate traffic congestion

in this part of the community. Therefore, I would favor the traffic signal as the solution to this issue

3. **Treatment of the Downtown Streetscape:** If First Street is converted into the carrier of all ferry traffic, then I would strongly favor Option C that was provided by the consultants to guide future improvements along Highway 104 in downtown Kingston. If it is decided that First St. should carry only inbound ferry traffic and Highway 104 outbound traffic, then I would favor an option that would preserve the median where it is, eliminate the limited parking on Highway 104 in this section to create a broader sidewalk, and use the local lanes as sharrows for bike traffic. My reasons for supporting Option C are as follows:
   - Converting “Main St.” into a two way carrier with travel lanes flanking the existing median and with Class 2 bicycle paths on the outside of those travel lanes allows for the creation of broad boulevard style sidewalks to create a unique environment for pedestrians with street trees, outdoor dining, etc. In this way, Highway 104 through downtown Kingston would truly become a “Complete Street”.
   - If portions of the existing median could be converted into “rain gardens”, it would have the additional benefit of treating storm water runoff in the downtown which would be unique indeed.
   - By eliminating curbs, this option would be accessible to all and provide the opportunity to close off the street for street fairs, public events, etc. This option would allow for downtown to become a destination for tourists and residents alike, leading to the increased economic viability of the businesses along this corridor.
4. **Washington St. Park:** While this project is being pursued by the Port of Kingston per a plan developed by the Port last year, there are some notions of changing the design of the park to accommodate storm water management. While the idea is intriguing, the notion of excavating the site to accommodate storm water management while exposing the visual mess along the border of the ferry property is not a good idea. As planned, the park has an excellent opportunity to serve as a primary public gathering place and gateway into Kingston from the ferry terminal. The park needs to be designed to screen what are now the ugly views of the ferry property, not to expand those views to those in downtown Kingston. On the other hand, if the park can be designed to accept and treat storm water while concealing views of its border with the ferry terminal, that would be the best of both worlds.
5. **Washington Street improvements:** Kudos to the County Department of Public Works for securing grant funding to improve Washington Street from Highway 104 to Second Street. This project can demonstrate how the community can realize significant and tangible improvements to its circulation network and its infrastructure strategically over time. The County is to be congratulated for its initiative on this score.
6. **Parking:** I was not surprised that parking within the downtown area is underutilized. While I have heard frustrations from certain members of the community that parking is inadequate, it is just not the case. In fact, Kingston should be so lucky to have a parking problem!

That concludes my comments for now and I sincerely hope that they are useful to the County and their consultants in crafting an optimum plan for improvements for the special community of Kingston.

COMMENT FORM

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Please provide comments/information to assist in the planning and design process. If you have questions, please provide contact information for response.

I think the complete streets plan should extend past the Village Green on West Kingston to the West boundary at Lindvog. Often vehicles are parked along W. Kingston on both sides of the street extending out beyond the white bike lane line. (Supposedly "legal" for small cars if inside white line.) Big events like Kitsap Arts Festival, 4TH of July, KHS Home Coming, are especially pedestrian dangerous. Other times like Pie Auction, School events, tennis matches, private parties, etc parking happens on W. Kingston too. Not safe. Much more parking, pedestrian needs when Community Center opens.

Smaller is better in planning for Kingston. No more "development." Have you planners heard of dwindling resources? Climate change? Living with less? Consuming less? Protect Apple Tree Cove from any more human impact. Improve enjoyment of our area in natural ways! See that run off into the Cove from streets & parking & construction does not pollute. Puget Sound is a mess! Humans did it. To some of us livability means small!

M. Bode

Return form to: Greg Cioc, Kitsap County Public Works, gcioc@co.kitsap.wa.us
614 Division St. MS-26
Port Orchard, WA 98366
Questions? 360-337-5777

Kingston Complete Streets Design Charrette

4-8 p.m., September 15, 2015, Kingston Community Center

PLEASE SIGN IN:

Name	Affiliation	Phone	E-mail
Greg Cioc	KCPW	360 337 4660	
Walt Elliott	Citizen	360-297-2845	elliott.moon@comcast.net
Karen Ross + Dick Nowak	citizen	360-271-1586	delane60@yahoo.net
Rebecca Pirtle	KCBPC	337.4650	rpirtle@co.kitsap.wa.us
Tom + Rosalee Waggoner	Citizen	360-297-3606	
RITA OSBORN + Rick EVERETT		360-881-0163	
Bruce MacIntyre	Citizen		BruceM@portofkingston.org
Don Willott		206-455-4775	dwillott@mac.com
Bruce Bachen	Squeaky Wheels	206 855-1667	bachenb@comcast.net
Rick Feeney	West Sound Cycling Club	360-731-9609	rfeeney@wavecable.com
Margaret LeMay	Resident	360 297 8402	
Marilyn Bode	Resident	297-2213	lidenbode@aol.com
Lee Metcalfe			leemet@gmail.com
Jeff Peterson		6124991518	jeff.peterson@fbpartnership.com
MARK + KRIS Libby		360 297 8983	
JEFF BOUMA		2067803651	jeff@fbpartnership.com

Kingston Complete Streets Design Charrette

4-8 p.m., September 15, 2015, Kingston Community Center

PLEASE SIGN IN:

Name	Affiliation	Phone	E-mail
Nancy Langwith	GKEDC, KCA	954-560-3327	langwithn52@gmail.com
Susan Bridges		360-551-0029	susan@web-o.net.
T. Keith Gurnee		707/696-2937	tkgurnee@gmail.com
Dina Kingsley		360·860·1354	KINGSTONCOVESTUDIO@GMAIL.COM
Sarah Parrington			Kingston, WA.
Bill and Joy Engel-Sanders.		425-503-7981-	sachsand@hotmail.com
John & Bettianne Sjoberg			bjsjobergs@gmail.com
Jerry Kirschner	GKEDC		kirschnerj43@gmail.com
Evan Stoll	KAPOS/MKTA		stolle@comcast.net
Lena Parks		360-297-7574	lena444@centurytel.net
Jan Richards		689-4051	jammajammas@gmail.com
Mary McClure		297-4300	mary@contrarymac.com
Bim Prince		509-8986	BimPrince@Hotmail.com
MaryAnn Harris		360·286-4448	maharris@bandwagon.net.
Judy Willett		206·842-6939	

MacLeod Reckord
Landscape Architecture ■ Planning ■ Urban Design
110 Prefontaine Place South, Suite 600
Seattle, Washington 98104
P 206-323-7919
F 206-323-9242

Kingston Complete Streets

Meeting Notes
April 6, 2016
Consultant Attendees:
Connie Reckord, Jennifer Barnes, Tatyana Vashchenko, Terry Reckord;
Consultant Team
Kingston Citizen Advisory Council

These notes contain the comments, questions and responses recorded by the project team during and after the presentation held at the public meeting. E-mailed and written comments submitted directly by respondents are attached. Open house sign-in sheets are available from the County.

Purpose of meeting: Present to the public the final draft version of the report, with overview of the process, scope of effort, and synopsis of recommendations. There was opportunity for public comment at the meeting, and mail/email comments were received until April 15, 2016.

Questions (Q) / Responses (R) / Comments (C):

General Questions/Comments:

Q: Where is a hard copy of the draft report available?
R, *County*: On line, at Port offices, at Library.

Q: Is the SR 104 plan for relocation of ferry traffic a foregone conclusion?
R, *County*: No, however there is discussion coming up (ref April 16 meeting at Poulsbo City Hall) with legislators about projects important to the area, and this is one of them. The County is advancing the discussion and will pursue funding if it is determined the project is a good candidate.

Q: Do these projects align with the goals/policies as stated in the sub-area plan?
R, MR: Yes, the goals and policies in the draft made available to the team were reviewed and the KCS project recommendations align with those goals.

C: This plan provides a good approach for moving ahead with improvements for bikes and pedestrians.

C. We don't like the addition of a viewpoint on Washington Boulevard. It will only be another hangout for the drug activity that goes on there now. [Considerable discussion on this topic of drug activity in this area, lack of enough policing to keep this activity from growing, and in general lack of Kitsap County sheriff resources in Kingston.].

Q: What happened to the public process? This is the first we've been made aware of the project.

R, *County*: This is the third public meeting on the larger planning project, however there will be more public meetings that will focus on specific neighborhoods once the projects are defined, prioritized, and a decision is made to proceed with improvements. We will publish notices and distribute directly to those neighborhoods so you are advised when project level planning will occur.

C: *(Design Team)*: We are looking for input from the community on prioritization of projects, so please consider that in any follow-up comments.

Q: What is the schedule for development of Washington Boulevard?

R, *County*: Design this year and construction next year. Yes, the project has received funding.

C: *(Comm. Gelder)*: The Board of County Commissioners will review and adopt the KCS Plan, and would recommend that KCAC also formally adopt the plan in order to give it some standing in the community.

COMMENT FORM

Kingston Complete Streets

April 6, 2016 KCAC/Public Meeting

Please provide comments/information **NO LATER THAN** **APRIL 15, 2016** to assist in finalizing the document. If you have questions, please provide contact information for response.

"Observations and Comments"

*Tuesday morning, april 12th 2016: two police cars respond to activity on 1st and Wa. Blvd.
*Vandalism on 2ND and Wa. Blvd; signage torn down.
These two referenced events are just our "normal" happenings in the immediate areas of Wa. Blvd. The neighborhood implores you to listen and involve us in your plans for our future. a meeting with those effected in the heart of your proposal would be in your best interest. The "Kingston Complete Streets" should not be finalized until issues of concern are addressed.

Respectfully Submitted,
Linda M. Slothaug
Wa. Blvd.

Return form to: David Forte,
Kitsap County Public Works,
dforte@co.kitsap.wa.us
614 Division St. MS-26
Port Orchard, WA 98366
Questions? 360-337-7210

Connie Reckord

From: Bruce MacIntyre <brucem@portofkingston.org>
Sent: Tuesday, April 12, 2016 5:16 PM
To: Connie Reckord
Cc: Walt Elliott; Mary McClure; Jim Pivarnik; Nancy Payne
Subject: Complete Streets Draft Report

Connie,
Thank you for the draft report sent out earlier and for taking the time to discuss my initial reactions in our phone conversation last week. I thought it might be helpful for me to follow up with an email now that I have had a chance to review the draft report itself. Please keep in mind that although this is coming from my Port email account, these are personal opinions and I do not speak for the Commission or the Port. These are just my own thoughts after having reviewed the draft. I hope you will add these comments to the other public comments received in advance of the close of the comment period (which I understand is tomorrow, April 13) and consider them in your preparation of the final draft.

As a preliminary matter, it seems to me that there are at least two documents not included in the Bibliography that would have been helpful – or at least informative – to the Complete Streets study. By law, RCW 53.20.010, the Port is required to develop and maintain a "comprehensive scheme of harbor improvements", or as it more commonly called, the Port's master plan or strategic plan. This publicly available document, which was last updated in 2012, includes, among other things, the Port's short, medium and long term goals for development, e.g., the acquisition of property, property development plans, etc. The other document is a publicly financed study conducted in 2015 concerning the viability of a boutique hotel in Kingston. This study was paid for by the Kitsap Economic Development Alliance (KEDA), with additional support from the local KEDA affiliate, GKEDC. This study specifically examined whether there was sufficient demand and a viable market in Kingston for a boutique or other type of hotel/motel. The conclusion, in short, was that there is not enough demand for such a project and that traditional (i.e., profit motivated) investors would not likely be attracted to this market at any time in the foreseeable future. Moreover, the market for hotels in this portion of Kitsap County was seen as approaching saturation (if not over saturation) with the ongoing substantial expansion of the Clearwater Casino Hotel, the planned construction of a new hotel at the Point Casino, and potentially another new hotel in Poulsbo. Accordingly, an economic development envelope study that focuses on hotel development in Kingston without acknowledging either the strategic plan or the KEDA study does not seem to add any meaningful substance and, in some circles, may be considered uninformed or at least confusing.

More importantly with respect to the envelope study, the drawings seem to incorrectly identify either the streets or the property owned by the Port (or both). To begin with, the map of "Catalytic sites" implies that the majority of Mike Wallace Park should be under consideration for development, whereas only the upper level of that corner (the present location of the coffee stand and adjacent parking) and the concrete pad area should be considered for further development. Also, although the first drawing in the envelope study correctly shows that property as lying east of Washington Boulevard, both drawings incorrectly depict Central Avenue as extending the full length of the south side of that property. In reality, Central Avenue ends at Washington Boulevard and the area depicted as Central Avenue is actually a critical part of the Port's parking lot. Moreover, the Port does not own the block west of Washington Boulevard between Central Avenue and Highway 104, as depicted in the second drawing, except for the corner lot occupied by the Yacht Club building. The Yacht Club site is not currently under consideration for further development, and is not likely to be considered for redevelopment in the foreseeable future. Finally, notes on the drawings propose to balance the removal of existing parking along Washington Boulevard with underground parking that would appear to require removal of existing park area, rather than the "expansion of grassy park area" as stated – perhaps a result of the misplacement of Central Avenue on the drawings. The weaknesses in this portion of the draft report should not go unaddressed in the final report. (By the way, I do not believe that any aspect of the envelope study was ever discussed with Port staff or commissioners, which might have avoided some of these issues.)

The draft report should in no way suggest that the Port has approved the concept of a mixed use bicycle path across Mike Wallace Park and along the water front of the West Kingston Road properties. Although these concepts were presented and discussed at our December meeting, I recall some very legitimate concerns being expressed at the idea of (1) mixing bicyclists and pedestrians on the walkway; (2) the environmental and cost issues related to expanding the existing overwater pier to accommodate bicycle unloading; and (3) the pouring of additional concrete across the heart of the grassy area of Mike Wallace Park. There are also significant safety issues in mixing bicycle commuters with families, dogs and children playing in the park, not to mention injecting dozens of bicycles into moving vehicle traffic in the parking lot during the commuter hours. Mike Wallace park is a family park, not a pathway for bicycle commuters; if improving the unloading of bicycles from the ferry is a goal, that is primarily a WSDOT issue. The cost of resolving that issue is not properly foisted off on park users to absorb.

With respect to the depiction (page 91) of a "Shoreline Trail" across the West Kingston Road properties, I am strongly opposed to any representation that implies a limitation or obstruction to the Port's ultimate decisions with respect to the development of these properties. As we discussed on the phone again last week, I know that these are intended to be only conceptual options. However, the depiction of such a trail in the Complete Streets Study may lead some members of the community to wrongly conclude that there is Port buy-in to this plan, causing the Port to encounter additional – and unnecessary – criticism and resistance if the ultimate development of these properties does not allow for such a trail. I hope you will delete that depiction from the final report.

A related issue arises in the draft report with respect to the concept of a stormwater garden on some part of the Port's properties. It was evident our earlier discussions that the county's stormwater planning is in its very early stages and that some of the county's planning assumptions (e.g., placing a stormwater facility across the head of the boat ramp) would cause unacceptable disruption of the public's access to and use of Port facilities. The suggestion (Appendix B.4, Section 4) that an understanding or agreement in principal has been reached or that the Port has identified a preferred site is not, in my mind, an accurate portrayal of the current status. I believe the Port remains open to further discussions that may lead to some sort of cooperative arrangement, but it should be noted that preservation of the Port's development and use options is a paramount concern that may ultimately outweigh the benefits of a joint County/Port stormwater garden.

I hope you will find these comments useful and take them into consideration as you prepare the final report. As stated above, these are not the opinions of the Port or of the Commission, but only my own thoughts; the ultimate position of the Port with respect to any of these issues can only be determined by the Commission acting as a body.

Thank you for all the work you have done on this study; please feel free to contact me if you wish to discuss any of these issues in greater detail.

Bruce MacIntyre

Connie Reckord

From: David Forte <DForte@co.kitsap.wa.us>
Sent: Monday, April 18, 2016 11:15 AM
To: Connie Reckord; Greg Cioc
Subject: FW: Complete streets of Kingston

One more comment came in.

Thanks

David Forte
Transportation Planning
360-337-7210
dforte@co.kitsap.wa.us

-----Original Message-----
From: Barbara Huget [mailto:bhuget@windermere.com]
Sent: Saturday, April 16, 2016 7:51 PM
To: David Forte <DForte@co.kitsap.wa.us>
Subject: Complete streets of Kingston

I find there is some disconnect in the thinking of Kitsap county when they feel a town should grow in the direction where every street has to ingress and egress over a road designated for ferry entering and exiting. We already have people waiting in line to go to schools, to the new park, to the movies and restaurants that are part of our town. We all look at each other incredulously on this side of town! What are you thinking? We are already growing out toward West Kingston with the village green, library, gym, theaters, dining. We are a quiet residential area where retired people and children walk in peace without sidewalks. The only thing that has disturbed that is the County' s wisdom in raping a forest up ohio and putting in self help housing and a while ago the plat of skyward loop. Now we have traffic going over the speed limit always garbage and break-ins. Thank you. And we have no police or some that tell us to walk out and take pictures of drug pushers and then let them know. Most of the residents between 2nd and 3rd from Washington to Illinois ave have lived here for 40 years and more. We used to back out of our drive ways onto Ohio and people were polite. Now we get almost run over.
Why not be considerate of the people who have lived and enjoyed this area for so long?
Why would you even consider a viewing point in front of people's homes ? You are depriving them, the people who are paying taxes for that view, of the peace and enjoyment of that view. I don't see that happening anywhere people have a view of the mountain. Indianola? Laurel hurst? Mercer island? Think about what you are doing. Don't try to screw up our town anymore than you've already done. The other beauty enhancements are usually left to weeds and trash.

Regards,

Barb Huget
Real Estate Professional
Windermere
Sent from my iPad