

INTERSTATE 5 COLUMBIA RIVER CROSSING

Archaeology Technical Report for the Final Environmental Impact
Statement



May 2011

**Title VI**

The Columbia River Crossing project team ensures full compliance with Title VI of the Civil Rights Act of 1964 by prohibiting discrimination against any person on the basis of race, color, national origin or sex in the provision of benefits and services resulting from its federally assisted programs and activities. For questions regarding WSDOT's Title VI Program, you may contact the Department's Title VI Coordinator at (360) 705-7098. For questions regarding ODOT's Title VI Program, you may contact the Department's Civil Rights Office at (503) 986-4350.

Americans with Disabilities Act (ADA) Information

If you would like copies of this document in an alternative format, please call the Columbia River Crossing (CRC) project office at (360) 737-2726 or (503) 256-2726. Persons who are deaf or hard of hearing may contact the CRC project through the Telecommunications Relay Service by dialing 7-1-1.

¿Habla usted español? La información en esta publicación se puede traducir para usted. Para solicitar los servicios de traducción favor de llamar al (503) 731-4128.

This page intentionally left blank.

Cover Sheet

Interstate 5 Columbia River Crossing

Archaeology Technical Report for the Final Environmental Impact Statement

Submitted By:

Rick Minor, Principal Investigator - Heritage Research Associates, Inc.

This page intentionally left blank.

TABLE OF CONTENTS

1. SUMMARY	1-1
1.1 Introduction	1-1
1.2 The APE	1-2
1.3 Description of Alternatives	1-2
1.3.1 Adoption of a Locally Preferred Alternative	1-4
1.3.2 Description of the LPA.....	1-4
1.3.3 LPA Construction	1-12
1.3.4 The No-Build Alternative.....	1-13
1.4 Coordination and Consultation.....	1-14
2. METHODS	2-1
2.1 Objective	2-1
2.2 Study Area	2-2
2.3 Regulatory Setting and Effects Guidelines	2-3
2.4 Research Design.....	2-4
2.5 Permits and Approvals	2-6
3. AFFECTED ENVIRONMENT	3-1
3.1 Geological and Geomorphic Setting	3-1
3.2 Cultural Setting.....	3-2
3.3 Defining Characteristics of the CRC APE	3-3
3.4 Field Methods.....	3-3
3.4.1 Integrated Approach to Ground-Penetrating Radar and Archaeology	3-3
3.4.2 Adapting Field Methods to Field Conditions	3-5
3.4.3 Implemented Field Methodology	3-6
3.5 Results of Investigations on the Oregon Shore	3-6
3.6 Results of Investigations on the Washington Shore	3-9
3.6.1 Site Nomenclature	3-10
3.6.2 Prehistoric Archaeology.....	3-16
3.6.3 Historical Archaeology.....	3-21
4. ASSESSMENT OF ADVERSE EFFECT AND RESOLUTION TO ADVERSE EFFECT	4-1
4.1 Effects	4-1
4.2 Work Remaining and to be Incorporated into MOA	4-2
4.2.1 Determination of Significance at W8B and W13.....	4-2
4.2.2 Transit Alignments in Vancouver, Washington	4-3
4.2.3 Casting and Staging Areas.....	4-4
4.2.4 Submerged Shelf on Washington Shore	4-5
4.2.5 Oregon Shore.....	4-5
4.2.6 Submittal of Final Report	4-5
5. PERMITS AND APPROVALS	5-1
5.1 Federal	5-1
5.2 State.....	5-1
5.3 Local.....	5-1

6. REFERENCES.....6-1

List of Exhibits

Exhibit 1-1. Archaeological Area of Potential Effect for the CRC Project 1-3
Exhibit 1-2. Proposed C-TRAN Bus Routes Comparison..... 1-10
Exhibit 1-3. Construction Activities and Estimated Duration..... 1-12
Exhibit 1-4. Areas of Potential Effect (APE) for the Project Area – Potential Staging Areas
and Casting Yards and Ruby Junction Maintenance Facility 1-15
Exhibit 3-1. Stratigraphic Cross-section Showing the Varying Depths of the Pleistocene
Gravels across the Lower Columbia River Valley 3-4
Exhibit 3-2. Map of GPR Survey Areas and Geoarchaeological Borehole Locations on the
Oregon Shore 3-8
Exhibit 3-3. Areas Investigated in Southern Portion of CRC APE on the Washington Shore 3-12
Exhibit 3-4. Areas Investigated in Northern Portion of CRC APE on the Washington Shore..... 3-13
Exhibit 3-5. Summary of Archaeological Investigations by Area on the Washington Shore 3-14
Exhibit 3-6. Summary of Archaeological Investigations for the CRC Project on the
Washington Shore 3-15
Exhibit 3-7. Concordance of Sites Recorded in WSDOT Parcels on East Side of I-5/SR 14
Interchange with Previously Recorded Sites in VNHR..... 3-16
Exhibit 3-8. Stone Tools and Debitage from WSDOT Sites and VNHR Areas 3-18
Exhibit 3-9. Portion of Goethals’ “A Map of the Country in the Vicinity of Vancouver
Barracks, Washington Territory” (1883) showing relationship of Historic City of
Vancouver to Military Reservation..... 3-22
Exhibit 3-10. Summary Description of Archaeological Resources on the Washington Shore
Assessed as Eligible Under NRHP Criterion D 3-25
Exhibit 3-11. Archaeological Resources Identified in Southern Portion of CRC APE on the
Washington Shore 3-27
Exhibit 3-12. Archaeological Resources Identified in Northern Portion of CRC APE on the
Washington Shore 3-28
Exhibit 3-13. Summary of Significance Evaluation 3-30

List of Appendices

Appendix 1A Cultural Background
Appendix 1B Archaeological Discovery and Evaluation: ODOT Parcels
Appendix 1C Archaeological Discovery and Evaluation: WSDOT Parcels
Appendix 1D Results of National Park Service Archaeological Evaluation and Testing on
the Vancouver National Historic Reserve for the Columbia River Crossing
Project

ACRONYMS

Acronym	Description
ADA	Americans with Disabilities Act
AINW	Archaeological Investigations Northwest, Inc.
APE	area of potential effect
BNSF	Burlington Northern Santa Fe Railroad
CD	collector-distributor
CRC	Columbia River Crossing
CTR	Commute Trip Reduction (Washington)
C-TRAN	Clark County Public Transit Benefit Area Authority
DAHP	Washington Department of Archaeology and Historic Preservation
DEIS	Draft Environmental Impact Statement
DOE	Determination of Eligibility
ECO	Employee Commute Options (Oregon)
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GPR	Ground-Penetrating Radar
HERITAGE	Heritage Research Associates, Inc.
HBC	Hudson Bay Company
I-5	Interstate 5
LPA	Locally Preferred Alternative
LRV	light rail vehicle
MHz	Megahertz
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Parks Service
NRHP	National Register of Historic Places
ODOT	Oregon Department of Transportation
OTC	Oregon Transportation Commission
PMLR	Portland-Milwaukie Light Rail Project
ROD	Record of Decision
RTC	Regional Transportation Council

SHPO	Oregon State Historic Preservation Office
SPUI	single-point urban interchange
TDM	transportation demand management
TriMet	Tri-County Metropolitan Transportation District
TSM	transportation system management
VNHR	Vancouver National Historic Reserve
WSDOT	Washington State Department of Transportation
WTC	Washington Transportation Commission

1. Summary

1.1 Introduction

The Columbia River Crossing (CRC) project is a bridge, transit, and highway improvement project under joint development by the Washington Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT), in cooperation with the Federal Highway Administration (FHWA) and the Federal Transit Authority (FTA), as well as other sponsoring agencies. This project seeks to improve safety, access, and capacity for traffic and transit in the Interstate 5 (I-5) corridor crossing the Columbia River between Portland, Oregon, and Vancouver, Washington.

This report describes the methods and results of archaeological investigations carried out for the purpose of discovering and evaluating archaeological resources found within the area of potential effect (APE) for the CRC project. The objective of this report is to provide detailed information on the locations of significant prehistoric and historical archaeological sites that may be affected by the CRC project. This project is a challenging one for archaeology, because in terms of environmental and historical contexts the APE in Oregon and Washington could hardly be more different.

The APE in Oregon extends across the Columbia River flood plain, where evidence of prehistoric Native American occupation may potentially occur in sand and silt deposits in excess of 30 m deep. Euroamerican settlement on the Oregon shore in the historic period remained limited until the early decades of the twentieth century, when development was spurred by the growth of motor transportation and construction of bridges over the Columbia River. Significant archaeological sites dating to the historic period are unlikely to be encountered. The primary focus of investigations on the Oregon shore is on archaeological remains associated with Native Americans in the prehistoric period.

The situation is reversed in the APE on the Washington shore. Sand and silt deposits from the Columbia River are shallow and archaeological remains are relatively close to the surface. Some use of the area by prehistoric Native Americans occurred earlier, but the APE on the north shore mainly stands out as the setting of intense settlement and development during the historic period. The Hudson's Bay Company's (HBC) Fort Vancouver and Kanaka Village, and the U.S. Army's Vancouver Barracks, are situated directly east of the I-5 corridor in the Vancouver National Historic Reserve (VNHR). The VNHR encompasses properties owned by the National Park Service (NPS), U.S. Army, and the City of Vancouver. The Historic City of Vancouver, containing the core blocks first platted in the city, lies directly west of the I-5 corridor. Historical archaeology thus becomes the major focus of investigations on the Washington shore of the Columbia River.

The CRC project's location along a major interstate corridor requires that the archaeological investigations be undertaken according to a phased approach (36 CFR 800.4(b)(2)). Access to conduct archaeological investigations necessary to discover buried historic properties is restricted in large portions of the project area due to the actively and intensively used nature of the I-5 corridor. Some of the inaccessible portions of the APE are known to have a high potential to contain prehistoric and/or historical archaeological resources.

In addition, the APE in Oregon extends vertically through Holocene flood plain soils to Pleistocene gravels 30 m or more below the surface. Together with the issue of limited accessibility to conduct investigations within the narrow I-5 corridor, discovery and treatment of

deeply buried sites is problematic and best undertaken in focused areas once the level of project design provides a high level of certainty of where possible impacts may occur. Ongoing archaeological investigations are geared toward using appropriate techniques to diligently secure archaeological and geoarchaeological data that will contribute to determining the likely presence of archaeological resources, and if possible the character and significance of any archaeological sites, found within the APE for the CRC project.

1.2 The APE

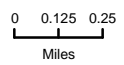
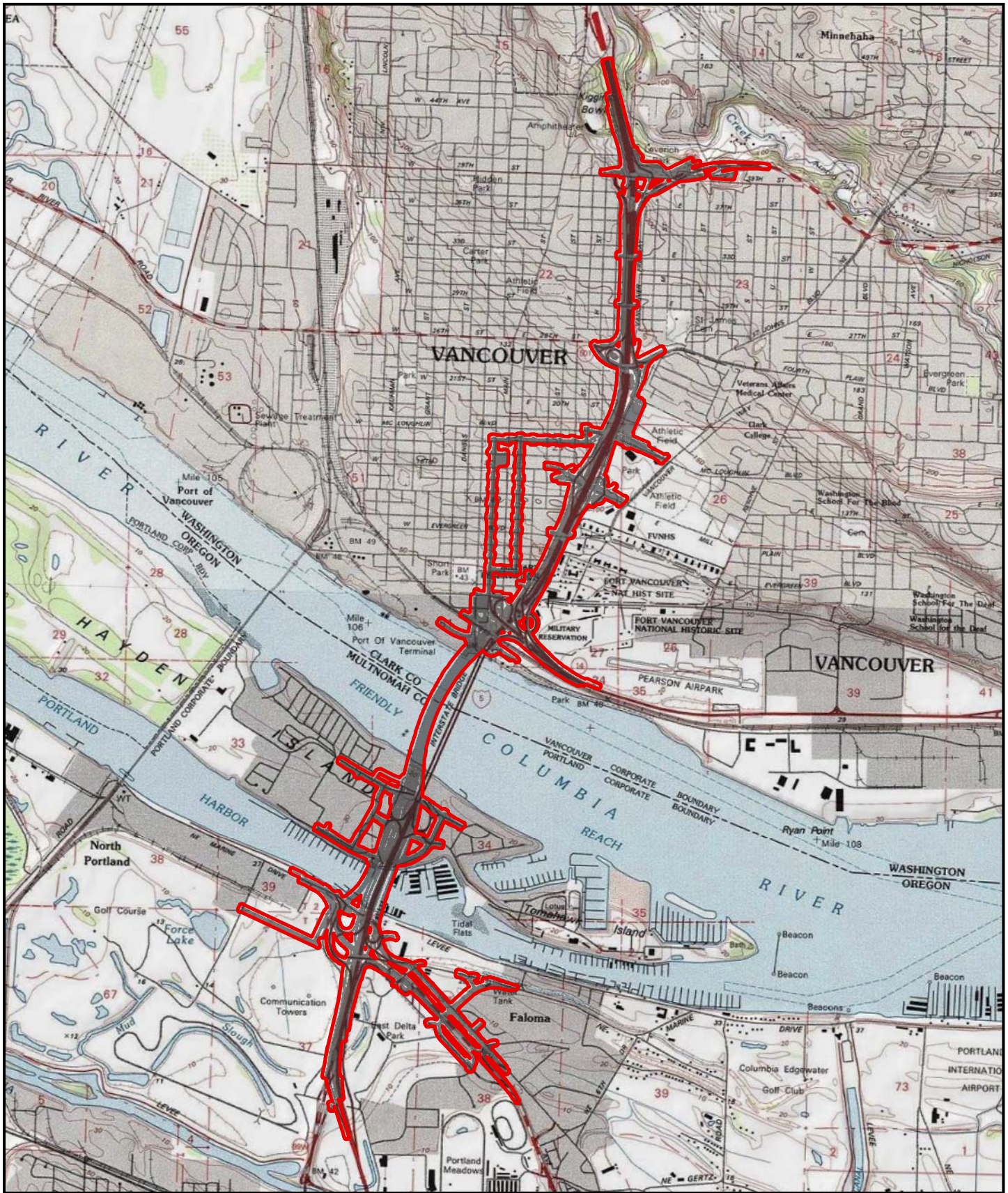
The APE is the geographic area within which an undertaking may directly or indirectly cause alterations in the character of historic properties, if any such properties exist (36 CFR 800.16). Specifically and primarily pursuant to 36 CFR 800.16(d), the APE for all historic property concerns regarding the CRC project extends along I-5 for approximately 5 miles from Victory Boulevard in Portland, Oregon, northward to SR 500 in Vancouver, Washington, and encompasses areas of concern regarding *all* of the various types of historic properties that might be affected by the project. The project's potential effects on the historic built environment resources encompasses the largest land area and forms the overall project APE (refer to the *Historic Built Environment Technical Report*).

The present report, however, is concerned with the archaeological area of concern within which direct and indirect effects to archaeological resources are reasonably expected to occur (Exhibit 1-1). The archaeological APE includes the project's proposed footprint, inclusive of existing facilities to be improved, new rights-of-way, and areas identified for construction and project staging. Additional parts of the APE include proposed transit alignments in Vancouver and proposed expansion of the Ruby Junction Maintenance Facility in Gresham, Oregon. The project also will address any potential impacts to archaeological resources in the VNHR.

In terms of legal description, the archaeological APE in Oregon occupies approximately 225 acres in Multnomah County in T1N, R1E, Sections 3 and 4, and T2N, R1E, Sections 33 and 34. In Washington, the archaeological APE extends over approximately 422 acres in Clark County in T2N, R1E, Sections 14, 15, 22, 23, 26, 27, and 34.

1.3 Description of Alternatives

This technical report evaluates the CRC project's locally preferred alternative (LPA) and the No-Build Alternative. The LPA includes two design options: The preferred option, LPA Option A, which includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge; and LPA Option B, which does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor (CD) lanes on the two new bridges that would be built adjacent to I-5. In addition to the design options, if funding availability does not allow the entire LPA to be constructed in one phase, some roadway elements of the project would be deferred to a future date. This technical report identifies several elements that could be deferred, and refers to that possible initial investment as LPA with highway phasing. The LPA with highway phasing option would build most of the LPA in the first phase, but would defer construction of specific elements of the project. The LPA and the No-Build Alternative are described in this section.



- APE - Area of Potential Effect
- Project Footprint

Exhibit 1-1. Preliminary Area of Potential Effect (APE), Archaeological



1.3.1 Adoption of a Locally Preferred Alternative

Following the publication of the Draft Environmental Impact Statement (DEIS) on May 2, 2008, the project actively solicited public and stakeholder feedback on the DEIS during a 60-day comment period. During this time, the project received over 1,600 public comments.

During and following the public comment period, the elected and appointed boards and councils of the local agencies sponsoring the CRC project held hearings and workshops to gather further public input on and discuss the DEIS alternatives as part of their efforts to determine and adopt a locally preferred alternative. The LPA represents the alternative preferred by the local and regional agencies sponsoring the CRC project. Local agency-elected boards and councils determined their preference based on the results of the evaluation in the DEIS and on the public and agency comments received both before and following its publication.

In the summer of 2008, the local agencies sponsoring the CRC project adopted the following key elements of CRC as the LPA:

- A replacement bridge as the preferred river crossing,
- Light rail as the preferred high-capacity transit mode, and
- Clark College as the preferred northern terminus for the light rail extension.

The preferences for a replacement crossing and for light rail transit were identified by all six local agencies. Only the agencies in Vancouver – the Clark County Public Transit Benefit Area Authority (C-TRAN), the City of Vancouver, and the Regional Transportation Council (RTC) – preferred the Vancouver light rail terminus. The adoption of the LPA by these local agencies does not represent a formal decision by the federal agencies leading this project – the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) – or any federal funding commitment. A formal decision by FHWA and FTA about whether and how this project should be constructed will follow the FEIS in a Record of Decision (ROD).

1.3.2 Description of the LPA

The LPA includes an array of transportation improvements, which are described below. When the LPA differs between Option A and Option B, it is described in the associated section. For a more detailed description of the LPA, including graphics, please see Chapter 2 of the FEIS.

1.3.2.1 Multimodal River Crossing

Columbia River Bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through-lanes and two add/drop lanes. Lanes and shoulders would be built to full design standards.

The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede the take-offs and landings by aircraft using Pearson Field or Portland International Airport to the east. The new bridge structures over the

Columbia River would not include lift spans, and both of the new bridges would each be supported by six piers in the water and two piers on land.

North Portland Harbor Bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained to accommodate all mainline I-5 traffic. As discussed at the beginning of this chapter, two design options have emerged for the Hayden Island and Marine Drive interchanges. The preferred option, LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge. LPA Option B does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor lanes on the two new bridges that would be built adjacent to I-5.

LPA Option A: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridges. Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridges would carry traffic merging onto or exiting off of I-5 southbound. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound.

The fourth new structure would be built slightly farther west and would include a two-lane arterial bridge for local traffic to and from Hayden Island, light rail transit, and a multi-use path for pedestrians and bicyclists. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

LPA Option B: This option would build the same number of structures over North Portland Harbor as Option A, although the locations and functions on those bridges would differ, as described below. The existing bridge over North Portland Harbor would be widened and would receive seismic upgrades.

LPA Option B does not have arterial lanes on the light rail/multi-use path bridge. Direct access between Marine Drive and the island would be provided with collector-distributor lanes. The structures adjacent to the highway bridge would carry traffic merging onto or exiting off of mainline I-5 between the Marine Drive and Hayden Island interchanges.

1.3.2.2 Interchange Improvements

The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between Victory Boulevard in Portland and SR 500 in Vancouver. These improvements include some reconfiguration of adjacent local streets to complement the new interchange designs, as well as new facilities for bicyclists and pedestrians along this corridor.

Victory Boulevard Interchange

The southern extent of the I-5 project improvements would be two ramps associated with the Victory Boulevard interchange in Portland. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to the Victory Boulevard/Denver Avenue off-ramp. The other ramp improvement would lengthen the merge distance for northbound traffic entering I-5 from Denver Avenue. The current merging ramp would be extended to become an add/drop (auxiliary) lane which would continue across the river crossing.

Potential phased construction option: The aforementioned southbound ramp improvements to the Victory Boulevard interchange may not be included with the CRC project. Instead, the

existing connections between I-5 southbound and Victory Boulevard could be retained. The braided ramp connection could be constructed separately in the future as funding becomes available.

Marine Drive Interchange

All movements within this interchange would be reconfigured to reduce congestion for motorists entering and exiting I-5 at this location. The interchange configuration would be a single-point urban interchange (SPUI) with a flyover ramp serving the east to north movement. With this configuration, three legs of the interchange would converge at a point on Marine Drive, over the I-5 mainline. This configuration would allow the highest volume movements to move freely without being impeded by stop signs or traffic lights.

The Marine Drive eastbound to I-5 northbound flyover ramp would provide motorists with access to I-5 northbound without stopping. Motorists from Marine Drive eastbound would access I-5 southbound without stopping. Motorists traveling on Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection.

The new interchange configuration changes the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. These two streets would access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct connection to I-5 northbound.

In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this connection would allow traffic to turn right from Vancouver Way and accelerate onto Martin Luther King Jr. Boulevard. On the south side of Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east.

A new multi-use path would extend from the Bridgeton neighborhood to the existing Expo Center light rail station and from the station to Hayden Island along the new light rail line over North Portland Harbor.

LPA Option A: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via an arterial bridge over North Portland Harbor. There would be some variation in the alignment of local streets in the area of the interchange between Option A and Option B. The most prominent differences are the alignments of Vancouver Way and Union Court.

LPA Option B: With this design option, there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island would travel on the collector-distributor bridges that would parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

Potential phased construction option: The aforementioned flyover ramp could be deferred and not constructed as part of the CRC project. In this case, rather than providing a direct eastbound Marine Drive to I-5 northbound connection by a flyover ramp, the project improvements to the interchange would instead provide this connection through the signal-controlled SPUI. The flyover ramp could be constructed separately in the future as funding becomes available.

Hayden Island Interchange

All movements for this interchange would be reconfigured. The new configuration would be a split tight diamond interchange. Ramps parallel to the highway would be built, lengthening the ramps and improving merging speeds. Improvements to Jantzen Drive and Hayden Island Drive would include additional through, left-turn, and right-turn lanes. A new local road, Tomahawk Island Drive, would travel east-west through the middle of Hayden Island and under the I-5 interchange, improving connectivity across I-5 on the island. Additionally, a new multi-use path would be provided along the elevated light rail line on the west side of the Hayden Island interchange.

LPA Option A: A proposed arterial bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5.

LPA Option B: With this design option there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that parallel each side of I-5 over North Portland Harbor.

SR 14 Interchange

The function of this interchange would remain largely the same. Direct connections between I-5 and SR 14 would be rebuilt. Access to and from downtown Vancouver would be provided as it is today, but the connection points would be relocated. Downtown Vancouver I-5 access to and from the south would be at C Street rather than Washington Street, while downtown connections to and from SR 14 would be made by way of Columbia Street at 4th Street.

The multi-use bicycle and pedestrian path in the northbound (eastern) I-5 bridge would exit the structure at the SR 14 interchange, and then loop down to connect into Columbia Way.

Mill Plain Interchange

This interchange would be reconfigured into a SPUI. The existing “diamond” configuration requires two traffic signals to move vehicles through the interchange. The SPUI would use one efficient intersection and allow opposing left turns simultaneously. This would improve the capacity of the interchange by reducing delay for traffic entering or exiting the highway.

This interchange would also receive several improvements for bicyclists and pedestrians. These include bike lanes and sidewalks, clear delineation and signing, short perpendicular crossings at the ramp terminals, and ramp orientations that would make pedestrians highly visible.

Fourth Plain Interchange

The improvements to this interchange would be made to better accommodate freight mobility and access to the new park and ride at Clark College. Northbound I-5 traffic exiting to Fourth Plain would continue to use the off-ramp just north of the SR 14 interchange. The southbound I-5 exit to Fourth Plain would be braided with the SR 500 connection to I-5, which would eliminate the non-standard weave between the SR 500 connection and the off-ramp to Fourth Plain as well as the westbound SR 500 to Fourth Plain Boulevard connection.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including bike lanes, neighborhood connections, and access to the park and ride.

SR 500 Interchange

Improvements would be made to the SR 500 interchange to add direct connections to and from I-5. On- and off-ramps would be built to directly connect SR 500 and I-5 to and from the north, connections that are currently made by way of 39th Street. I-5 southbound traffic would connect to SR 500 via a new tunnel underneath I-5. SR 500 eastbound traffic would connect to I-5 northbound on a new on-ramp. The 39th Street connections with I-5 to and from the north would be eliminated. Travelers would instead use the connections at Main Street to connect to and from 39th Street.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including sidewalks on both sides of 39th Street, bike lanes, and neighborhood connections.

Potential phased construction option: The northern half of the existing SR 500 interchange would be retained, rather than building new connections between I-5 southbound to SR 500 eastbound and from SR 500 westbound to I-5 northbound. The ramps connecting SR 500 and I-5 to and from the north could be constructed separately in the future as funding becomes available.

1.3.2.3 Transit

The primary transit element of the LPA is a 2.9-mile extension of the current Metropolitan Area Express (MAX) Yellow Line light rail from the Expo Center in North Portland, where it currently ends, to Clark College in Vancouver. The transit element would not differ between LPA and LPA with highway phasing. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the LPA:

- Three park and ride facilities in Vancouver near the new light rail stations.
- Expansion of Tri-County Metropolitan Transportation District's (TriMet's) Ruby Junction light rail maintenance base in Gresham, Oregon.
- Changes to C-TRAN local bus routes.
- Upgrades to the existing light rail crossing over the Willamette River via the Steel Bridge.

Operating Characteristics

Nineteen new light rail vehicles (LRV) would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used by TriMet's MAX system. With the LPA, LRVs in the new guideway and in the existing Yellow Line alignment are planned to operate with 7.5-minute headways during the "peak of the peak" (the two-hour period within the 4-hour morning and afternoon/evening peak periods where demand for transit is the highest) and 15-minute headways during off-peak periods.

Light Rail Alignment and Stations

Oregon Light Rail Alignment and Station

A two-way light rail alignment for northbound and southbound trains would be constructed to extend from the existing Expo Center MAX station over North Portland Harbor to Hayden Island. Immediately north of the Expo Center, the alignment would curve eastward toward I-5, pass beneath Marine Drive, then rise over a flood wall onto a light rail/multi-use path bridge to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5, as would a new station immediately west of I-5. The alignment would extend northward on Hayden Island along the western edge of I-5, until it transitions into the hollow support structure of the new western bridge over the Columbia River.

Downtown Vancouver Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would curve slightly west off of the highway bridge and onto its own smaller structure over the Burlington Northern Santa Fe (BNSF) rail line. The double-track guideway would descend on structure and touch down on Washington Street south of 5th Street, continuing north on Washington Street to 7th Street. The elevation of 5th Street would be raised to allow for an at-grade crossing of the tracks on Washington Street. Between 5th and 7th Streets, the two-way guideway would run down the center of the street. Traffic would not be allowed on Washington between 5th and 6th Streets and would be two-way between 6th and 7th Streets. There would be a station on each side of the street on Washington between 5th and 6th Streets.

At 7th Street, the light rail alignment would form a couplet. The single-track northbound guideway would turn east for two blocks, then turn north onto Broadway Street, while the single-track southbound guideway would continue on Washington Street. Seventh Street will be converted to one-way traffic eastbound between Washington and Broadway with light rail operating on the north side of 7th Street. This couplet would extend north to 17th Street, where the two guideways would join and turn east.

The light rail guideway would run on the east side of Washington Street and the west side of Broadway Street, with one-way traffic southbound on Washington Street and one-way traffic northbound on Broadway Street. On station blocks, the station platform would be on the side of the street at the sidewalk. There would be two stations on the Washington-Broadway couplet, one pair of platforms near Evergreen Boulevard, and one pair near 15th Street.

East-west Light Rail Alignment and Terminus Station

The single-track southbound guideway would run in the center of 17th Street between Washington and Broadway Streets. At Broadway Street, the northbound and southbound alignments of the couplet would become a two-way center-running guideway traveling east-west on 17th Street. The guideway on 17th Street would run until G Street, then connect with McLoughlin Boulevard and cross under I-5. Both alignments would end at a station east of I-5 on the western boundary of Clark College.

Park and Ride Stations

Three park and ride stations would be built in Vancouver along the light rail alignment:

- Within the block surrounded by Columbia, Washington 4th and 5th Streets, with five floors above ground that include space for retail on the first floor and 570 parking stalls.
- Between Broadway and Main Streets next to the stations between 15th and 16th Streets, with space for retail on the first floor, and four floors above ground that include 420 parking stalls.
- At Clark College, just north of the terminus station, with space for retail or C-TRAN services on the first floor, and five floors that include approximately 1,910 parking stalls.

Ruby Junction Maintenance Facility Expansion

The Ruby Junction Maintenance Facility in Gresham, Oregon, would need to be expanded to accommodate the additional LRVs associated with the CRC project. Improvements include additional storage for LRVs and other maintenance material, expansion of LRV maintenance bays, and expanded parking for additional personnel. A new operations command center would also be required, and would be located at the TriMet Center Street location in Southeast Portland.

Local Bus Route Changes

As part of the CRC project, several C-TRAN bus routes would be changed in order to better complement the new light rail system. Most of these changes would re-route bus lines to downtown Vancouver where riders could transfer to light rail. Express routes, other than those listed below, are expected to continue service between Clark County and downtown Portland. The following table (Exhibit 1-2) shows anticipated future changes to C-TRAN bus routes.

Exhibit 1-2. Proposed C-TRAN Bus Routes Comparison

C-TRAN Bus Route	Route Changes
#4 - Fourth Plain	Route truncated in downtown Vancouver
#41 - Camas / Washougal Limited	Route truncated in downtown Vancouver
#44 - Fourth Plain Limited	Route truncated in downtown Vancouver
#47 - Battle Ground Limited	Route truncated in downtown Vancouver
#105 - I-5 Express	Route truncated in downtown Vancouver
#105S - I-5 Express Shortline	Route eliminated in LPA (The No-Build runs articulated buses between downtown Portland and downtown Vancouver on this route)

Steel Bridge Improvements

Currently, all light rail lines within the regional TriMet MAX system cross over the Willamette River via the Steel Bridge. By 2030, the number of LRVs that cross the Steel Bridge during the 4-hour PM peak period would increase from 152 to 176. To accommodate these additional trains, the project would retrofit the existing rails on the Steel Bridge to increase the allowed light rail speed over the bridge from 10 to 15 mph. To accomplish this, additional work along the Steel Bridge lift spans would be needed.

1.3.2.4 Tolling

Tolling cars and trucks that use the I-5 river crossing is proposed as a method to help fund the CRC project and to encourage the use of alternative modes of transportation. The authority to toll the I-5 crossing is set by federal and state laws. Federal statutes permit a toll-free bridge on an

interstate highway to be converted to a tolled facility following the reconstruction or replacement of the bridge. Prior to imposing tolls on I-5, Washington and Oregon Departments of Transportation (WSDOT and ODOT) would have to enter into a toll agreement with U.S. Department of Transportation (DOT). Recently passed state legislation in Washington permits WSDOT to toll I-5 provided that the tolling of the facility is first authorized by the Washington legislature. Once authorized by the legislature, the Washington Transportation Commission (WTC) has the authority to set the toll rates. In Oregon, the Oregon Transportation Commission (OTC) has the authority to toll a facility and to set the toll rate. It is anticipated that prior to tolling I-5, ODOT and WSDOT would enter into a bi-state tolling agreement to establish a cooperative process for setting toll rates and guiding the use of toll revenues.

Tolls would be collected using an electronic toll collection system: toll collection booths would not be required. Instead, motorists could obtain a transponder that would automatically bill the vehicle owner each time the vehicle crossed the bridge, while cars without transponders would be tolled by a license-plate recognition system that would bill the address of the owner registered to that license plate.

The LPA proposes to apply a variable toll on vehicles using the I-5 crossing. Tolls would vary by time of day, with higher rates during peak travel periods and lower rates during off-peak periods. Medium and heavy trucks would be charged a higher toll than passenger vehicles. The traffic-related impact analysis in this FEIS is based on toll rates that, for passenger cars with transponders, would range from \$1.00 during the off-peak to \$2.00 during the peak travel times (in 2006 dollars).

1.3.2.5 Transportation System and Demand Management Measures

Many well-coordinated transportation demand management (TDM) and transportation system management (TSM) programs are already in place in the Portland-Vancouver Metropolitan region and supported by agencies and adopted plans. In most cases, the impetus for the programs is from state-mandated programs: Oregon's Employee Commute Options (ECO) rule and Washington's Commute Trip Reduction (CTR) law.

The physical and operational elements of the CRC project provide the greatest TDM opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- Major new light rail line in exclusive right-of-way, as well as express bus and feeder routes;
- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians, and improve connectivity, safety, and travel time;
- Park and ride lots and garages; and
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded TSM programs maximize capacity and efficiency of the system. These include:

- Replacement or expanded variable message signs or other traveler information systems in the CRC project area;
- Expanded incident response capabilities;

- Queue jumps or bypass lanes for transit vehicles where multi-lane approaches are provided at ramp signals for entrance ramps;
- Expanded traveler information systems with additional traffic monitoring equipment and cameras, and
- Active traffic management.

1.3.3 LPA Construction

Construction of bridges over the Columbia River is the most substantial element of the project, and this element sets the sequencing for other project components. The main river crossing and immediately adjacent highway improvement elements would account for the majority of the construction activity necessary to complete this project.

1.3.3.1 Construction Activities Sequence and Duration

The following table (Exhibit 1-3) displays the expected duration and major details of each element of the project. Due to construction sequencing requirements, the timeline to complete the initial phase of the LPA with highway phasing is the same as the full LPA.

Exhibit 1-3. Construction Activities and Estimated Duration

Element	Estimated Duration	Details
Columbia River bridges	4 years	<ul style="list-style-type: none"> • Construction is likely to begin with the bridges. • General sequence includes initial preparation, installation of foundation piles, shaft caps, pier columns, superstructure, and deck.
Hayden Island and SR 14 interchanges	1.5 - 4 years for each interchange	<ul style="list-style-type: none"> • Each interchange must be partially constructed before any traffic can be transferred to the new structure. • Each interchange needs to be completed at the same time.
Marine Drive interchange	3 years	<ul style="list-style-type: none"> • Construction would need to be coordinated with construction of the southbound lanes coming from Vancouver.
Demolition of the existing bridges	1.5 years	<ul style="list-style-type: none"> • Demolition of the existing bridges can begin only after traffic is rerouted to the new bridges.
Three interchanges north of SR 14	4 years for all three	<ul style="list-style-type: none"> • Construction of these interchanges could be independent from each other or from the southern half of the project. • More aggressive and costly staging could shorten this timeframe.
Light rail	4 years	<ul style="list-style-type: none"> • The river crossing for the light rail would be built with the bridges. • Any bridge structure work would be separate from the actual light rail construction activities and must be completed first.
Total Construction Timeline	6.3 years	<ul style="list-style-type: none"> • Funding, as well as contractor schedules, regulatory restrictions on in-water work, weather, materials, and equipment, could all influence construction duration. • This is also the same time required to complete the smallest usable segment of roadway – Hayden Island through SR 14 interchanges.

1.3.3.2 Major Staging Sites and Casting Yards

Staging of equipment and materials would occur in many areas along the project corridor throughout construction, generally within existing or newly purchased right-of-way or on nearby vacant parcels. However, at least one large site would be required for construction offices, to stage the larger equipment such as cranes, and to store materials such as rebar and aggregate. Suitable sites must be large and open to provide for heavy machinery and material storage, must have waterfront access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone, and must have roadway or rail access for landside transportation of materials by truck or train.

Three sites have been identified as possible major staging areas:

1. Port of Vancouver (Parcel 1A) site in Vancouver: This 52-acre site is located along SR 501 and near the Port of Vancouver's Terminal 3 North facility.
2. Red Lion at the Quay hotel site in Vancouver: This site would be partially acquired for construction of the Columbia River crossing, which would require the demolition of the building on this site, leaving approximately 2.6 acres for possible staging.
3. Vacant Thunderbird hotel site on Hayden Island: This 5.6-acre site is much like the Red Lion hotel site in that a large portion of the parcel is already required for new right-of-way necessary for the LPA.

A casting/staging yard could be required for construction of the over-water bridges if a precast concrete segmental bridge design is used. A casting yard would require access to the river for barges, including either a slip or a dock capable of handling heavy equipment and material; a large area suitable for a concrete batch plant and associated heavy machinery and equipment; and access to a highway and/or railway for delivery of materials.

Two sites have been identified as possible casting/staging yards:

1. Port of Vancouver Alcoa/Evergreen West site: This 95-acre site was previously home to an aluminum factory and is currently undergoing environmental remediation, which should be completed before construction of the CRC project begins (2012). The western portion of this site is best suited for a casting yard.
2. Sundial site: This 50-acre site is located between Fairview and Troutdale, just north of the Troutdale Airport, and has direct access to the Columbia River. There is an existing barge slip at this location that would not have to undergo substantial improvements.

1.3.4 The No-Build Alternative

The No-Build Alternative illustrates how transportation and environmental conditions would likely change by the year 2030 if the CRC project is not built. This alternative makes the same assumptions as the build alternatives regarding population and employment growth through 2030, and also assumes that the same transportation and land use projects in the region would occur as planned. The No-Build Alternative also includes several major land use changes that are planned within the project area, such as the Riverwest development just south of Evergreen Boulevard and west of I-5, the Columbia West Renaissance project along the western waterfront in downtown Vancouver, and redevelopment of the Jantzen Beach shopping center on Hayden Island. All traffic and transit projects within or near the CRC project area that are anticipated to be built by 2030 separately from this project are included in the No-Build and build alternatives.

Additionally, the No-Build Alternative assumes bridge repair and continuing maintenance costs to the existing bridge that are not anticipated with the replacement bridge option.

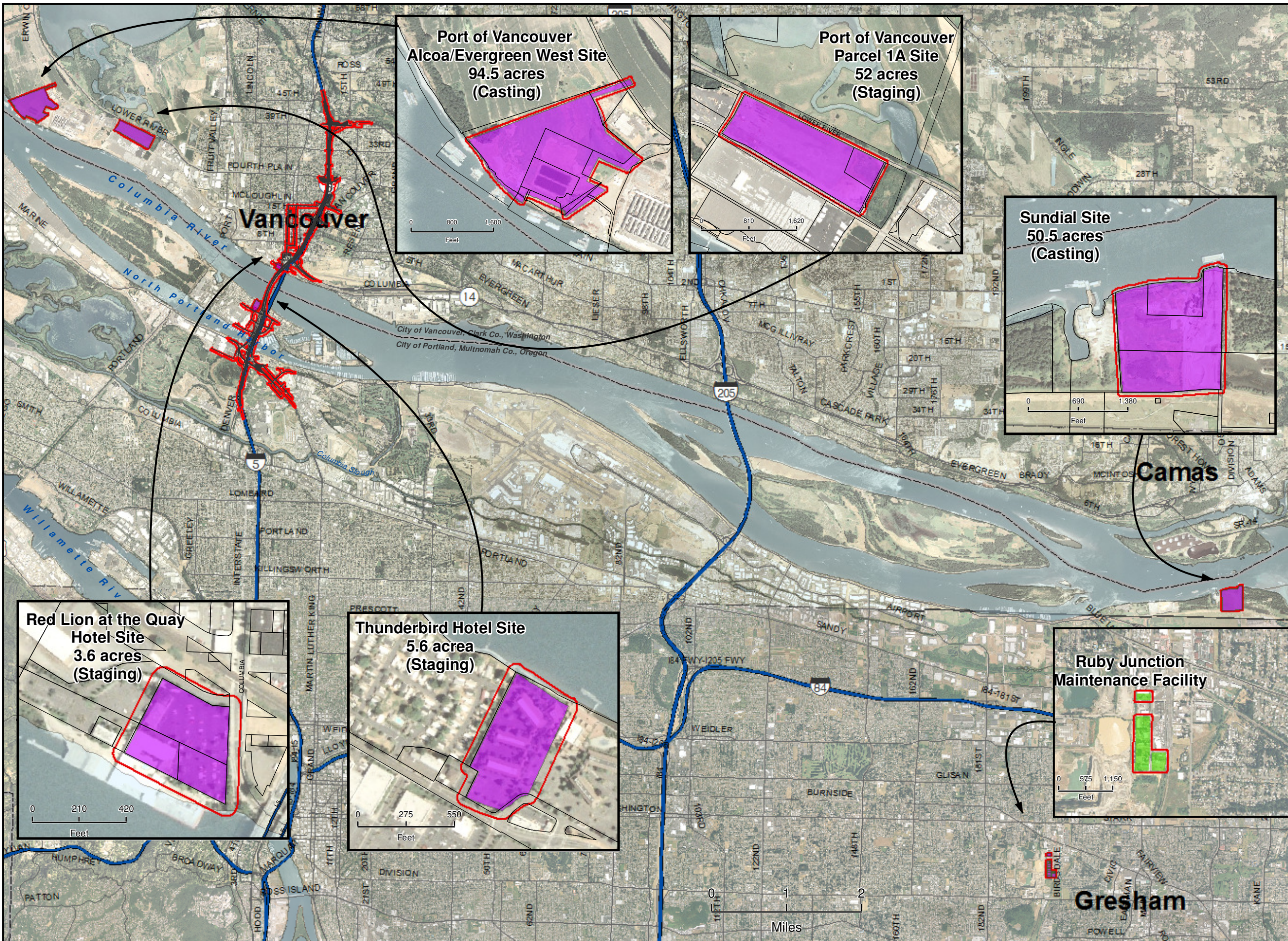
1.4 Coordination and Consultation

The archaeological field investigations for the CRC project were coordinated with the Washington State Department of Archaeology and Historic Preservation (DAHP), Oregon State Historic Preservation Office (SHPO), ODOT, WSDOT, and Native American Tribal governments. This coordination included meetings at the CRC office attended by Matthew Sterner (DAHP), Scott Williams, Roger Kiers, and Sarah Schufelt (WSDOT), and Carolyn McAleer (ODOT). Two meetings in the field were attended by Sterner, Williams, and Schufelt during the course of the fieldwork. Jenna Gaston and Tom Becker have served as Cultural Resource Coordinators for the CRC project.

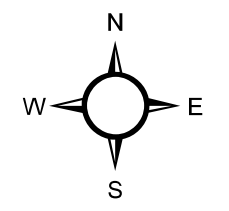
Native American tribes with interests in the project area were regularly notified as fieldwork progressed to facilitate site visits. Ed Arthur from the Cowlitz Indian Tribe participated in the discovery probing early in the field investigations on the Washington shore. Don Day and Brian Krehbiel of the Confederated Tribes of Grand Ronde served as tribal monitors during NPS excavations in the VNHR.

Tribes notified of the field investigations included the Cowlitz Indian Tribe, Confederated Tribes of the Grand Ronde Community of Oregon, Nez Perce Tribe, Confederated Tribes of Siletz Indians, Spokane Tribe of Indians, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Bands and Tribes of the Yakama Nation, and the Chinook Tribe.

Exhibit 1-4. Areas of Potential Effect (APE) for the Project Area, Potential Staging Areas and Casting Yards, and Ruby Junction Maintenance Facility



- Project Footprint
- Proposed Staging and Casting Areas
- Ruby Junction Maintenance Facility
- APE - Potential Direct Effect (50ft. buffer)



This page intentionally left blank.

2. Methods

The archaeological discovery and significance evaluation program for the CRC project primarily involved field investigations on all properties to which CRC was granted right-of-entry, including properties owned by ODOT, WSDOT, NPS, the U.S. Army, and the City of Vancouver. The investigations on the WSDOT and ODOT properties were undertaken by archaeologists from Heritage Research Associates, Inc. (HERITAGE), the principal archaeological consultant for the CRC project, with Rick Minor serving as Principal Investigator, directly overseeing all investigations. On the east side of I-5 in Washington, the CRC APE extends into the periphery of the VNHR, and includes properties owned by NPS, the U.S. Army, and the City of Vancouver. Archaeological investigations in the VNHR for the CRC project were undertaken by archaeologists from the NPS, with Douglas C. Wilson serving as Principal Investigator and Leslie O'Rourke as Field Supervisor.

In addition to the bridge replacements and improvements along the I-5 corridor, the CRC project includes three important non-highway-related elements: 1) light rail construction, particularly in downtown Vancouver; 2) Large Casting/Staging Yards; and 3) expansion of the Ruby Junction Maintenance Facility in Gresham. Access and current use issues precluded archaeological investigations in connection with these first two project elements.

The existing TriMet Ruby Junction Maintenance Facility in Gresham will be expanded to accommodate additional light rail vehicles needed for the CRC project. The Ruby Junction Maintenance Facility is also part of the Portland-Milwaukee Light Rail project (PMLR). Archaeological discovery investigations in connection with expansion of this facility were conducted by Archaeological Investigations Northwest (AINW), the archaeological consultant for the PMLR project. Pedestrian surveys and shovel test excavations in two of three high probability areas potentially affected by the proposed expansion found no archaeological evidence. No further archaeological work was recommended. Access to a third high probability area was denied by the landowner; survey in this area is recommended prior to construction (Punke et al. 2010:29).

2.1 Objective

The overall objective of the archaeological discovery investigations was to identify any significant evidence of human occupation or activity within the CRC project's APE over the last 12,000 years BP (Before Present). This date is derived from the estimated time of occurrence of the last of the Pleistocene Missoula Floods. At least 40 floods from cataclysmic releases of glacially-dammed Lake Missoula in Montana swept down the Columbia River, eroding away many of the earlier landforms and creating the modern landscape in the Lower Columbia Valley.

It was long thought that the last in this series of floods occurred around 20,000 BP, but more recent research indicates that "more than 13 floods perhaps postdate ca. 13 ka [13,000 years BP]" (Benito and O'Connor 2003:624). The Pleistocene gravels deposited by these floods serve as a baseline and reference point for archaeological investigations exploring for archaeological evidence through the full time range during which humans may have occupied the APE.

Scattered evidence, mostly in the form of Clovis and Folsom fluted projectile points, indicates the presence of Native Americans in the Pacific Northwest as early as 12,000 BP. Along the Middle

Columbia River, sites occupied by prehistoric peoples have been investigated and radiocarbon dated to as early as 10,000 BP (Ames et al. 1998). Currently, the earliest radiocarbon dated archaeological sites in the Lower Columbia Valley, where the CRC project is located, are only about 3,000 to 3,500 years old.

Extension of the search for evidence of human occupation in the CRC APE back to 12,000 BP requires an emphasis on the detailed reconstruction of the near-surface geology of the Portland-Vancouver Basin. This section of the Lower Columbia has been much less intensively studied by geologists in comparison to sections upstream in the Middle and Upper Columbia River Valley. The effort to identify strata buried deep below the ground surface that may potentially contain evidence of human occupation requires close collaboration between archaeologists and geologists. Archaeological investigations for the CRC project involve an integration of archaeology and geology, often referred to as the geoarchaeological approach, to a significantly greater extent than has been the case in previous archaeological research in the Lower Columbia Valley.

2.2 Study Area

The Study Area extends along the intensively developed I-5 corridor in Oregon and Washington. From Victory Boulevard in North Portland, Oregon, the study area stretches northward across the Columbia River flood plain, through the Marine Drive interchange, and crosses Oregon Slough to Hayden Island. With the exception of the Vanport Wetlands on the west side south of Marine Drive, the margins of the I-5 corridor are intensively developed with commercial, industrial and recreational land uses, roadways, and extensive above- and below-ground utilities.

In addition to the bridge replacements and improvements along the I-5 corridor, the CRC project includes three important non-highway-related elements: 1) light rail construction; 2) Casting/Staging Yards; and 3) expansion of the Ruby Junction Maintenance Facility in Gresham.

The nature of land disturbance in the Study Area varies widely, and includes a complex mix of deep excavations associated with features such as pier foundations, cuts associated with roadway excavations, fills associated with roadway and building locations, and various levels of grading ranging from parklands to parking lots. To date, archaeological discovery investigations on the Oregon shore for the CRC project have been limited for the most part to the narrow ODOT right-of-way and, more specifically, to areas where sediments are exposed along the margins of I-5 and associated interchanges.

From Hayden Island, the existing I-5 bridges extend across the Columbia River to Vancouver, Washington. Immediately north of the river, I-5 proceeds under an overpass for the Burlington Northern Railroad and through the SR 14 interchange. I-5 then continues northward through an intensively developed business district and adjacent residential neighborhoods.

The I-5 corridor immediately north of the Columbia River and through Vancouver is bounded on both sides by areas settled early in the historic period. East of I-5 is the site of the HBC Fort Vancouver established at this location in 1829, and the site of Vancouver Barracks, where the U.S. Army's presence dates to 1849 (Hussey 1957). This area is encompassed within the VNHR, listed on the National Register of Historic Places (NRHP) in 2007 (Owens et al. 2007). West of I-5 is the Historic City of Vancouver, the oldest portion of the city, which emerged to the west of the HBC Fort Vancouver beginning in the 1840s and 1850s.

Archaeological investigations on the Washington shore for the CRC project have been focused primarily on the narrow WSDOT right-of-way in areas where sediments are exposed along the margins of I-5 and associated interchanges, as well as immediately east of the I-5 corridor on the western periphery of the VNHR.

2.3 Regulatory Setting and Effects Guidelines

The archaeological investigations reported here were undertaken to ensure compliance by the CRC project with the National Historic Preservation Act (NHPA), National Environmental Policy Act (NEPA), and stipulations of the Transportation Act. The NHPA, as amended, requires that federal agencies identify and assess the effects of federally assisted undertakings on “historic properties” and to consult with others to find acceptable ways to avoid, minimize, or mitigate adverse effects.

As defined in 36 CFR Part 800, one of the key regulations implementing the NHPA, an “historic property means any prehistoric or historic district, site, building, structure or object included in or eligible for inclusion in the National Register of Historic Places... (and) includes artifacts... and remains that are related to and located within such properties.” Amendments to Section 106 of the NHPA in 1992 explicitly allowed properties of traditional religious and cultural importance to be eligible for inclusion in the NRHP.

In addition to federal laws, the CRC project is also subject to laws regarding the identification and protection of historic properties promulgated by each state. In Oregon, these statutes include Archaeological Sites and Objects (ORS 358.905 to 358.955), Permit and Conditions for Excavation or Removal of Archaeological or Historical Material on Public Lands (ORS 390.235), and Indian Graves and Protected Objects (ORS 97.740-97.760). In Washington, these laws include Archaeological Sites and Resources (RCW 27.53), Indian Graves and Records (RCW 27.44), and Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60).

Archaeological resources include the physical remains of human activity as evidenced in artifacts, remains, sites, buildings, structures, or objects. An archaeological resource is considered an “historic property,” and “significant” pursuant to 36 CFR 800, if it is determined to be National Register-eligible. Eligible properties generally must be at least 50 years old, possess integrity of physical characteristics, and meet at least one of the four criteria of significance:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history.
- B. That are associated with the lives of persons significant in our past.
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- D. That have yielded, or may be likely to yield, information important in prehistory or history.

The National Register eligibility of archaeological resources, and cultural resources in general, are based on criteria set forth in 36 CFR 60, further referenced in 36 CFR 800.4(c), and detailed in *Treatment of Archaeological Properties: A Handbook issued by the Advisory Council on Historic Preservation*, as well as in a series of bulletins, including:

- National Register Bulletin 15 – How to Apply the National Register Criteria for Evaluation.
- National Register Bulletin 36 – Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts.
- National Register Bulletin 36 (Revised) – Guidelines for Evaluating and Registering Archaeological Properties.
- National Register Bulletin 38 – Guidelines for Evaluating and Documenting Traditional Cultural Properties.
- National Register Bulletin 41 – Guidelines for Evaluating and Registering Cemeteries and Burial Places.

2.4 Research Design

The present report is the most recent in a series of documents pertaining to cultural resources that have been prepared for the CRC project. As a means of establishing the prehistoric and historic contexts of the project area, the prehistory, ethnography, ethnohistory, history, and historical archaeology were reviewed and summarized in the *Interstate 5 Columbia River Crossing Archaeology Technical Report* prepared for the project Draft Environmental Impact Statement (DEIS) (Minor et al. 2007). To establish a foundation for extending the search for evidence of prehistoric occupation to 12,000 BP, a synthesis of the geology and geomorphology of the project area was included as an appendix to the Archaeology Technical Report (Peterson 2007). These studies have been included as Appendix 1A to this document.

After the synthesis of the cultural background appeared in the DEIS, ethnohistorian Robert Boyd brought attention to references in the early historical literature to one or more Native American encampments on the Oregon shore across from Fort Vancouver. These encampments were occupied by native peoples drawn to the trading and other activity at the fort. The most important Indian settlement, the Cascades Indian winter encampment, "is clearly documented only for the post-fever and pre-reservation period, a time span of about twenty years, from 1833 to 1853" (Boyd 2010:1). Although the existing I-5 bridges are slightly downstream from Fort Vancouver, these references nevertheless point to the possibility of encountering evidence of these historic Native American encampments during construction of the CRC project.

In an effort to expand upon information contained in written documents, inquiries were made by CRC with consulting tribes as to their interest in conducting oral history studies about past Native American use of lands within the CRC project area. Reports were subsequently prepared by the Confederated Tribes of the Umatilla Indian Reservation (Engum 2009) and the Confederated Tribes of the Warm Springs Reservation of Oregon (Whipple 2009). The information presented in these studies was general in nature. Due to issues of confidentiality, the reports did not identify any specific cultural sites within the APE that might be addressed during the archaeological investigations for the CRC project.

To date, archaeological evidence of prehistoric Native American occupation has not been identified on the Oregon shore within, or in the close vicinity of, the CRC APE. Several reasons for this situation can be suggested:

- The CRC APE represents a very narrow transect across the Columbia River flood plain, and it may not include any areas in which Native American or historic period Euro-American sites are preserved.

- Evidence of Native American occupation and activity may be present, but over time it has been buried by natural flood deposits and/or introduced fill deposits associated with development in the twentieth century.
- Previous archaeological surveys have for the most part been limited to inspection of the existing ground surface and/or shallow probing. These efforts have not employed methods suitable for locating Native American sites buried under historic fill or within alluvium deposited over the last 12,000 years.

Fourteen archaeological sites have been recorded on the Washington shore of the Columbia River within, or in the vicinity of, the CRC APE. Eight of these recorded sites are associated with the VNHR (Owens et al. 2007) created in 1996 on the east side of the I-5 corridor: 1) HBC-USA Trash Dump (45CL47); 2) Officers Row (45CL160H); 3) Vancouver Barracks (45CL162H); 4) Fort Vancouver National Historic Site (45CL163H); 5) Old Apple Tree (45CL164H); 6) Pearson Air Park (45CL224); 7) Kanaka Village (45CL300H); and 8) Pearson Airfield (45CL524). With the exception of Pearson Airfield recorded in 2001, these sites were assigned site numbers in the late 1970s, before establishing site boundaries through archaeological fieldwork became a fundamental requirement in cultural resource management. The boundaries of these sites tend to be based more on administrative units than on archaeological data. Three of these sites are characterized by boundaries that overlap (the implication of this situation is considered below in Section 3.6.1).

Two sites, the Quartermaster East Site (45CL400) and Benoit Site (45CL401), are underwater in the Columbia River south of the VNHR. The remaining four recorded historical archaeological sites within the CRC APE (45CL514, 45CL582, 45CL583, 45CL687) are west of the I-5 corridor in the Historic City of Vancouver.

A pedestrian survey carried out by a team of two archaeologists found no evidence of prehistoric or historic occupation exposed on the ground surface along the margins of I-5 and within state rights-of-way in the CRC APE in Oregon or Washington. At the time, it was assumed that the negative survey results were due to the presence of a shallow mantle of soil introduced for landscaping purposes, and that this soil mantle was shallow enough that manual excavations would be sufficient to reach intact native soil below. Once the discovery archaeological investigations were underway, however, it became clear that construction of the existing I-5 interstate involved cut-and-fill activity on such a massive scale that mechanical excavations were the only effective means of identifying intact artifact-bearing strata and cultural features within the existing interstate rights-of-way within the CRC APE. Lands within the VNHR outside the existing right-of-way were not subject to impacts from highway construction.

Before any archaeological excavations were undertaken, a document titled *An Archaeological Research Design for the Washington Portion of the Columbia River Crossing CRC Project* was prepared, reviewed, and submitted to DAHP (Williams 2009). Building on the DEIS Archaeology Technical Report, this research design document discussed research domains and research questions that data recovered during archaeology in the CRC APE might potentially address. Various methods that might potentially be employed in identifying and evaluating archaeological sites were outlined in some detail. These methods ranged from remote sensing to manual probing and augering to mechanical coring and trenching.

The actual methods of investigation employed in the field were necessarily adapted to the variable ground conditions found in different subareas of the CRC APE (as described below in Section 3). A report describing the procedures and results of investigations on the ODOT parcels is presented in Appendix 1B, *Archaeological Discovery and Evaluation: ODOT Parcels*. A report

describing the procedures and results of investigations on the WSDOT parcels is provided in Appendix 1C, *Archaeological Discovery and Evaluation: WSDOT Parcels*.

Similarly, the investigations for the CRC project conducted by NPS in the portion of the CRC APE along the western periphery of the VNHR were guided by work plans compiled in a document entitled *Amendments to the Archaeological Research Design and Work Plan for Archaeological Testing, Columbia River Crossing Project, Vancouver National Historic Reserve, Washington* (Northwest Cultural Resources Institute 2009). A final report on investigations for the CRC project in five subareas on the VNHR is presented in Appendix 1D, *Results of National Park Service Archaeological Evaluation and Testing on the Vancouver National Historic Reserve for the Columbia River Crossing Project* (O'Rourke et al. 2010).

It should be noted that in this document elevations, borehole depths, and river miles are expressed in terms of U.S. customary units (e.g., feet above/below sea level). In keeping with common practice among most archaeologists working in the region today, measurements more directly related to archaeology (e.g., auger diameters, test pit size, excavation depth) are generally expressed in terms of the metric system.

2.5 Permits and Approvals

All proposed archaeological investigations undertaken for the CRC project were closely reviewed in advance by DAHP for Washington and by SHPO for Oregon. Tribal representatives were notified of proposed fieldwork in each work area. Archaeological investigations on the north shore of the Columbia River in Washington were conducted on WSDOT lands under the terms of Washington State Department of Transportation General Permits 47065 and 47066 (for ground-penetrating radar surveys) and General Permit 47428 (for discovery excavations and testing for significance evaluation). Archaeological discovery investigations on the south shore of the Columbia River in Oregon for the CRC project were conducted under the terms of State of Oregon Archaeological Permit No. 1148.

3. Affected Environment

3.1 Geological and Geomorphic Setting

The CRC APE is located at River Mile 106.4 in the Portland-Vancouver Basin of the Lower Columbia River Valley. This basin was formed early in the Pliocene by a gentle syncline, or downwarp, of flows of volcanic rock known collectively as Columbia River Basalt. Near the end of the Pliocene, the velocity of the Columbia River appears to have been slowed or impounded, leading to deposition of 1500 feet of fine-grained Sandy River Mudstone (Trimble 1963). The Columbia River Basalt and Sandy River Mudstone are not exposed in the CRC APE.

Before the end of the Pliocene a change in deposition occurred, as a sand and gravel delta, emanating from the west end of the Columbia Gorge, formed in the Portland-Vancouver Basin. These deposits are referred to as either Troutdale (cemented) or Pleistocene (uncemented) fluvial gravels. The upper member of the Troutdale Formation, which includes sand, cobbles, and boulders, ranges from 5- to 2-million years in age (Trimble 1963; Beeson and Tolan 1993). The younger Pleistocene gravel deposits could range from 2-million years in age to the last ice age (e.g., the late Wisconsin). The younger Pleistocene gravels occur well above the present grade of the Columbia River, indicating changing base levels in late-Pleistocene times.

Uncemented naturally stratified sand and silt deposits at elevations higher than historic flood heights or latest Holocene floods (approximately 35 feet NGVD29) represent cataclysmic flood deposits from glacial Lake Missoula. Multiple dam bursts from this glacial lake produced numerous sequences of fining-up beds called rhythmites, which were locally remobilized to form interbeds of loess (Lentz 1983). The youngest glacial flood deposits from Lake Missoula that inundated the Lower Columbia Valley are dated to about 12,000 BP, which corresponds to the temporal boundary for the CRC project. The upland terraces adjacent to the north and south sides of the Columbia River in the CRC APE are covered by the glacial flood rhythmites and loess, representing the latest-Pleistocene peri-glacial deposits (Beeson et al. 1991).

Sea level at 16,000 BP was approximately 360 feet below what it is today. At that time, the waters of the Columbia River flowed through a deep canyon several hundred feet below the surrounding landscape. As sea level rose, the valley floor was submerged. By 12,000 BP sea level extended upslope (landward) in the valley to an elevation of -230 feet. At the time of the deposition of Mazama ash from the eruption of Mount Mazama at approximately 7,700 BP, sea level in the Lower Columbia Valley was approximately -41 feet below what it is today.

The declining rate of sea level rise after 7,000 years ago resulted in sea level approaching its present elevation by several thousand years ago. Sea level and corresponding river level in the CRC project area have risen only 9.8 feet (3.0 m) in the last 3,000 years, a rate of about 1.0 mm/year.

The highest Columbia River flood on record in 1948 reached a measured height in the north Portland area of +32.8 feet (NGVD29). The flood of 1894 is reported to have had a slightly higher elevation. Other flood heights range from 17 feet for one-year freshets to 32 feet for 20-year floods (Kuper and Lawes 1994:12). Elevations on the south shore flood plain in the CRC APE range from 0.0- to +30 feet. Thus, this area was regularly subject to inundation from seasonal floods.

In comparison, the terrain on the north shore in the CRC APE ascends quickly, so that only a narrow strip of ground adjacent to the river lies at elevations of 30 feet or less and was subject to regular inundation and deposition of flood silts. The rising ground north of the river is covered by relatively shallow wind-blown loess deposits overlying Pleistocene gravels. The landscape near the north end of the CRC APE is cut by Burnt Bridge Creek, an overflow channel from the Missoula Floods. The flood waters cut a deeply incised canyon through which this small stream flows generally westward to its outlet at Vancouver Lake.

3.2 Cultural Setting

The abundant natural resources in the Lower Columbia Valley supported one of the densest Native American populations in North America. At the time of historic contact, native peoples who spoke Chinookan languages occupied villages and camps along the shores of the Lower Columbia River. Their dense population is reflected in the large number of archaeological sites associated with Native American occupation that have been recorded.

Although evidence of prehistoric Native Americans dating as early as 10,000 BP has been found farther upstream on the Columbia River, the archaeological record in the Lower Columbia Valley has a much more limited time depth. Evidence of early occupation on the valley floor has been submerged by rising sea levels or buried under alluvial deposits, with the result that the earliest radiocarbon dated sites along this section of the river date to only about 3,000 to 3,500 BP. Deep excavations below the present level of the Columbia River during construction of the CRC project have the potential to encounter evidence of prehistoric occupation much older than has so far been documented.

The CRC project area contains an historical archaeological record associated with settlement by Euroamericans and other ethnic groups that is unmatched anywhere else in the Pacific Northwest. This record begins with archaeological features, deposits, and artifacts from the HBC Fort Vancouver on the north bank of the Columbia River east of present-day I-5. Originally established in 1825 on high ground farther east, the fort was relocated in 1829 to the present site of the reconstructed stockade in the VNHR. An extensive multi-cultural settlement known historically as Kanaka Village, where the majority of the HBC employees lived, emerged along the southwest side of the fort. In 1849, the U.S. Army established Camp Vancouver on the upper plain above the HBC stockade. With establishment of a military reservation in 1850 the name was changed to Columbia Barracks. This post expanded over the years, with the name changed to Vancouver Barracks in 1879, to become one of the most important military installations in the Pacific Northwest during the late nineteenth and early twentieth century's.

The City of Vancouver developed beginning in the 1840s and 1850s on the north bank of the Columbia River immediately west of the military reserve. The Historic City of Vancouver, consisting of the first platted blocks, was situated in the area that today is immediately west of I-5. Archaeological remains in the city for the most part postdate the initial HBC occupation at Fort Vancouver and relate to civilian settlement and development coterminous with the U.S. Army occupation at Vancouver Barracks. Although much less intensively investigated compared to the area east of I-5, recent studies have shown that historical archaeological investigations in the oldest portions of the city have begun to shed light on the development over time of the Vancouver's urban environment.

3.3 Defining Characteristics of the CRC APE

The APE for the CRC project has a number of defining characteristics that directly affect efforts to meet the objective of identifying significant archaeological sites.

First, archaeological investigations conducted for the CRC project to date have been restricted for the most part to areas in which the CRC has obtained right-of-entry, primarily along I-5 and connecting interchanges (e.g., Marine Drive in Oregon, SR 14 and SR 500 in Washington). The areas available for archaeological investigations tend to be narrow linear strips of ground bounded by active travel lanes on one side and by chain link property fences on the other. The lands on the east side of I-5 in the VNHR are exceptional in this regard, as they occur for the most part in a long continuous strip, with only two small areas south of SR 14 set apart as separate parcels.

Second, the I-5 corridor within the CRC APE is a zone of intense past construction. This activity has involved earth-moving on a massive scale, including deep cuts into the native sediments and underlying gravels in some areas, and the introduction of deep fill deposits in other areas. As encountered during the archaeological investigations for the CRC project, evidence of cut-and-fill episodes from past construction sometimes occurs in the same local area. An additional aspect of past construction is the degree of compaction of the fill introduced along the margins of the roadways. As indicated by penetrometer measurements in the field, these fill deposits routinely yielded values that, according to engineering standards, are too compact for manual excavations. The lands on the east side of I-5 in the VNHR again are an exception to this situation, as they generally have not been subject to construction disturbance to the extent experienced by the WSDOT parcels.

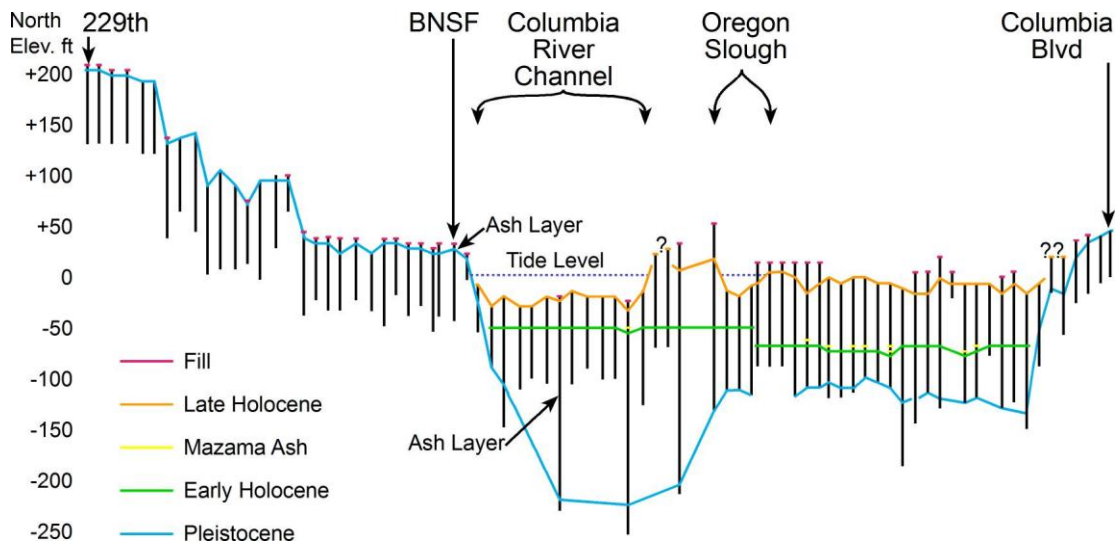
Third, the Pleistocene gravels, the geological baseline for the project, occur at significantly different depths below surface on either side of the Columbia River. As a means of documenting the depths of the target Pleistocene gravels, borehole logs recorded during previous geotechnical investigations drilled along the I-5 corridor were reviewed and compiled into a data base (Peterson 2007). A stratigraphic profile derived from this data base, extending north/south across the river valley, illustrates a significant difference in the near-surface geology on the two sides of the river (Exhibit 3-1). On the Washington shore, the Pleistocene gravels are relatively accessible, often within 1.2 to 1.5 m of the surface. In contrast, on the Oregon shore the Pleistocene gravels are deeply buried, generally in excess of 30 m below surface, beneath flood plain deposits. Obviously, the widely differing depths of the target Pleistocene gravels directly affects the strategies employed for identifying significant archaeological sites in the CRC APE.

3.4 Field Methods

3.4.1 Integrated Approach to Ground-Penetrating Radar and Archaeology

Experiments with various remote sensing methods have been conducted on the VNHR, but there has been little follow-through to assess the efficacy of these methods. The ground within the VNHR, a military reservation and national park, is less disturbed than in the WSDOT parcels. Remote sensing methods that might have some utility in the VNHR are unlikely to yield meaningful results in the WSDOT parcels. Considering the construction zone nature of the WSDOT rights-of-way along I-5, ground-penetrating radar (GPR) is the remote sensing method with the greatest potential for usefulness on the WSDOT parcels.

Exhibit 3-1. Stratigraphic Cross-section Showing the Varying Depths of the Pleistocene Gravels across the Lower Columbia River Valley



As proposed in *Archaeological Work Plan for Ground-Penetrating Radar (GPR) Exploration, Columbia River Crossing Project* (Minor and Peterson 2008), before any excavations were undertaken, GPR surveys were conducted as a means of obtaining an understanding of the near-surface geology on the WSDOT parcels. The GPR surveys were conducted in phases, with both 200 to 250 megahertz (MHz) and 500 MHz antennae employed. The results of the GPR surveys were “ground-truthed” during the follow-up discovery probing and evaluative testing by regular inspection and profiling of exposed walls in backhoe trenches and manual excavation units.

The results proved highly useful in establishing 1) the extent of introduced materials from cut-and-fill activities, 2) the depth to native soils, and 3) the depth to the target Pleistocene gravels on the Washington shore (the gravels on the Oregon shore are much too deep below surface to be reached by GPR). The profile method of GPR data presentation, in which GPR data are presented as vertical cross-sections, proved highly amenable to comparison with the stratigraphy exposed in the trenches and test units. (The alternative to the profile method, time-slice amplitude mapping which presents data in horizontal slices, would not have been useful for interpreting the mixed and disturbed stratigraphy encountered on the WSDOT parcels).

The GPR profile data are archived as raw data files, processed data files, and .jpg cross-section plot images. The locations of the ground-truth sites, as well as any anomalies found to correspond to cultural features, were located directly on the GPR profiles, with all information compiled in a Ground-Truth Profiles database (Excel spreadsheet). For this report, the GPR results have been summarized in a separate section integrated into the reports prepared for each area/site on WSDOT parcels on which archaeological investigations were conducted (Appendix 1C).

On the less disturbed VNHR lands investigated by NPS, both GPR and magnetometer surveys were conducted before any excavations for the CRC project were undertaken. The results of these studies are presented in consultant’s reports included in the larger document prepared by NPS on investigations on the VNHR for the CRC project (Appendix 1D).

3.4.2 Adapting Field Methods to Field Conditions

In all areas within the ODOT and WSDOT rights-of-way where GPR surveys were conducted, the GPR data strongly suggested that the native soils, in which evidence of prehistoric and historic occupation might be found, are covered by fill material. The presence of deep fill deposits was repeatedly confirmed as the discovery investigations proceeded from one WSDOT parcel to another. The massive extent of cut-and-fill activities during past construction along I-5 and SR 14 gradually became apparent. The search beneath these fill deposits for native soils containing evidence of prehistoric and historic occupation, a search that routinely extended to the top of the underlying Pleistocene gravels, required a change in the anticipated approach to discovery probing.

It was originally assumed that discovery probing for archaeological deposits would follow a standard approach involving manual excavation of round (30-cm diameter) or square (50 x 50 cm) shovel probes placed at systematic intervals (e.g., 10-m apart) across each WSDOT parcel. This approach was successfully implemented, although not without difficulty, in the first parcel subjected to archaeological investigations (W17). In this parcel, however, the fill deposits were relatively shallow, and the Pleistocene gravels were close to the surface.

In the second parcel investigated (W9A), shovel probes (30-cm diameter) placed at 10-m intervals recovered historical artifacts as deep as 70-cm below surface (cmbs). However, the stratigraphic context of the artifacts remained uncertain because the small diameter of the probes precluded visual inspection of the sediments and the interval spacing hindered correlations in probes spaced so far apart. Historical artifacts were still being found at the maximum depths excavated in the probes (70 cm), and the top of the Pleistocene gravels had not been reached.

The stratigraphic context of the artifacts recovered in the probes became clear after excavation of a backhoe trench. The trench stratigraphy clearly showed that fill material containing historical artifacts extended to depths greater than the probes could reach. The historical artifacts recovered from the probes, then, occurred in fill material introduced onto the WSDOT property from elsewhere. The extent and depth of fill material across W9A was easily traced in the trench walls. The presence of historical materials in fill material was subsequently encountered on a regular basis during archaeological discovery probing on the other WSDOT parcels.

Below the fill material, near the bottom of the trench, a cultural feature was exposed consisting of black-stained sediments associated with a nineteenth century blacksmith shop at the U.S. Army Quartermaster's Depot. This feature would have been missed if discovery probing had been limited to shovel probe excavations. The backhoe trench excavation reached the top of the Pleistocene gravels, ensuring that the full time-depth represented in the sediments in W9A was tested for the presence of archaeological remains.

This sequence of discovery excavation methods, manual excavation of probes and/or test units followed by mechanical trenching with a backhoe, was repeated in the next three areas investigated (W9B, W5A, W5B). These investigations clearly demonstrated that limiting the discovery investigations to manual shovel probe excavations would have resulted in 1) misinterpretations of stratigraphy (e.g., in distinguishing fill and disturbed sediments from intact cultural deposits), and 2) failure to expose significant cultural features deeply buried beneath the surface. Mechanical trenching with a backhoe proved essential in establishing the presence or absence of archaeological remains in the construction zones along the I-5 corridor.

3.4.3 Implemented Field Methodology

Given the objective of extending the search for archaeological remains to the top of the target Pleistocene gravels, as well as the presence of substantial fill deposits along the I-5 corridor, mechanical excavations with a backhoe emerged as the most suitable method for archaeological discovery investigations in Washington. In the implemented field methodology, backhoe trenches were excavated first, with manual probes and test units excavated in follow-up investigations to more fully expose and document any cultural features encountered. In some areas the trenches were spaced at systematic intervals roughly 10-m apart (e.g., in W1, W8A, and W19A), but in most areas the trenches were placed opportunistically as best they could fit on the properties.

The backhoe trench excavations extended from the present-day ground surface into the top of the ca. 12,000-year-old Pleistocene gravels. In this manner, all evidence of cultural deposits and features, both prehistoric and historic, was exposed. The reliance on backhoe trench excavations during the discovery investigations is consistent with the feature-oriented nature of historical archaeology, the primary focus of the archaeological investigations on the Washington shore. The introduced fill covering the parcels is analogous to the layers of building debris that have to be removed before buried architectural and archaeological remains can be studied. Several extensive cut-and-fill episodes containing cultural debris were exposed in the trench excavations (e.g., in W5B and W19A) that could easily have been mistaken for intact cultural features if examined through the narrow aperture of a manual shovel probe or test unit.

The objective of extending the search for archaeological remains to the top of the Pleistocene gravels was successful in most of the WSDOT parcels. The Pleistocene gravels could not be reached in the south portion of W19A, where the gravels slope steeply downward toward the Columbia River. The gravels also could not be reached in W19C and W20, where the excavations extended across a former slough shown on early Sanborn maps that was later filled in to create new blocks for development in the City of Vancouver.

In some areas the trench excavations exposed very deep cut-and-fill episodes from previous highway construction that had removed the upper portion of the gravels. The most noteworthy example was in W5B, where an extensive cut-and-fill episode on the north side of SR 14 appears to have removed all evidence within the WSDOT right-of-way of the landscape feature known as the Pond.

The exposures provided in the backhoe trench walls proved crucial to understanding site formation processes, particularly in distinguishing different types of fill material (e.g., highway construction fill versus building rubble) from buried cultural strata. In discovery investigations under these conditions, recovery of individual artifacts found in undifferentiated deposits is not the primary concern. Instead, the focus is on the identification of intact artifact-bearing strata and cultural features that can yield meaningful information about the prehistoric and historic past.

3.5 Results of Investigations on the Oregon Shore

The objective of identifying any significant evidence of human activity or occupation within the CRC project's APE since 12,000 years BP is complicated by the considerable depth of the alluvial flood plain deposits on the Oregon shore. Previous borehole drilling has established that alluvial deposits measuring over 30 m in depth overlie the Pleistocene gravels in the project vicinity.

Historically, the flood plain in the project vicinity was subject to seasonal flooding by the Columbia River. Consequently, substantial fill material was imported when the interstate was

constructed to raise the grade of I-5 above the surrounding flood plain. The first task undertaken in the archaeological investigations was to establish the thickness of the artificial fill that covers the margins of I-5 in the CRC APE. Accomplishing this task was necessary in order to determine which archaeological discovery methods might be applicable in the CRC APE.

The task of establishing the depth of the introduced fill in the CRC APE on the Oregon shore was first addressed by means of GPR surveys. Preliminary GPR field tests on the Oregon shore established the necessity of employing high-power/low-frequency GPR systems (Bristow and Jol 2003) to penetrate through artificial fill to the prehistoric flood plain soils. GPR surveys were undertaken in six separate areas, recorded in terms of 20 profile lines, over a total distance of slightly over 1600 m (Exhibit 3-2).

GPR profiling indicated the presence of artificial fill deposits extending to substantial depths in all areas where the GPR surveys were conducted. In view of this situation, it became clear that measures beyond the standard approaches to archaeological site discovery were necessary. Manual probe excavations, and even mechanical trenching, would not be able to reach the depths required to sample the native soils below the artificial fill deposits.

Probing for deeply buried archaeological remains on the Oregon shore was undertaken by means of rotary-sonic coring to recover continuous samples of sediments from the present ground surface down to the Pleistocene gravels. Following preparation of a *Proposed Work Plan for Geoarchaeological Discovery Probing on the Oregon Shore for the CRC Project* (Minor et al. 2009), a rotary-sonic core was employed to drill 14 boreholes for geoarchaeological purposes in the CRC APE on the Oregon shore (Exhibit 3.2).

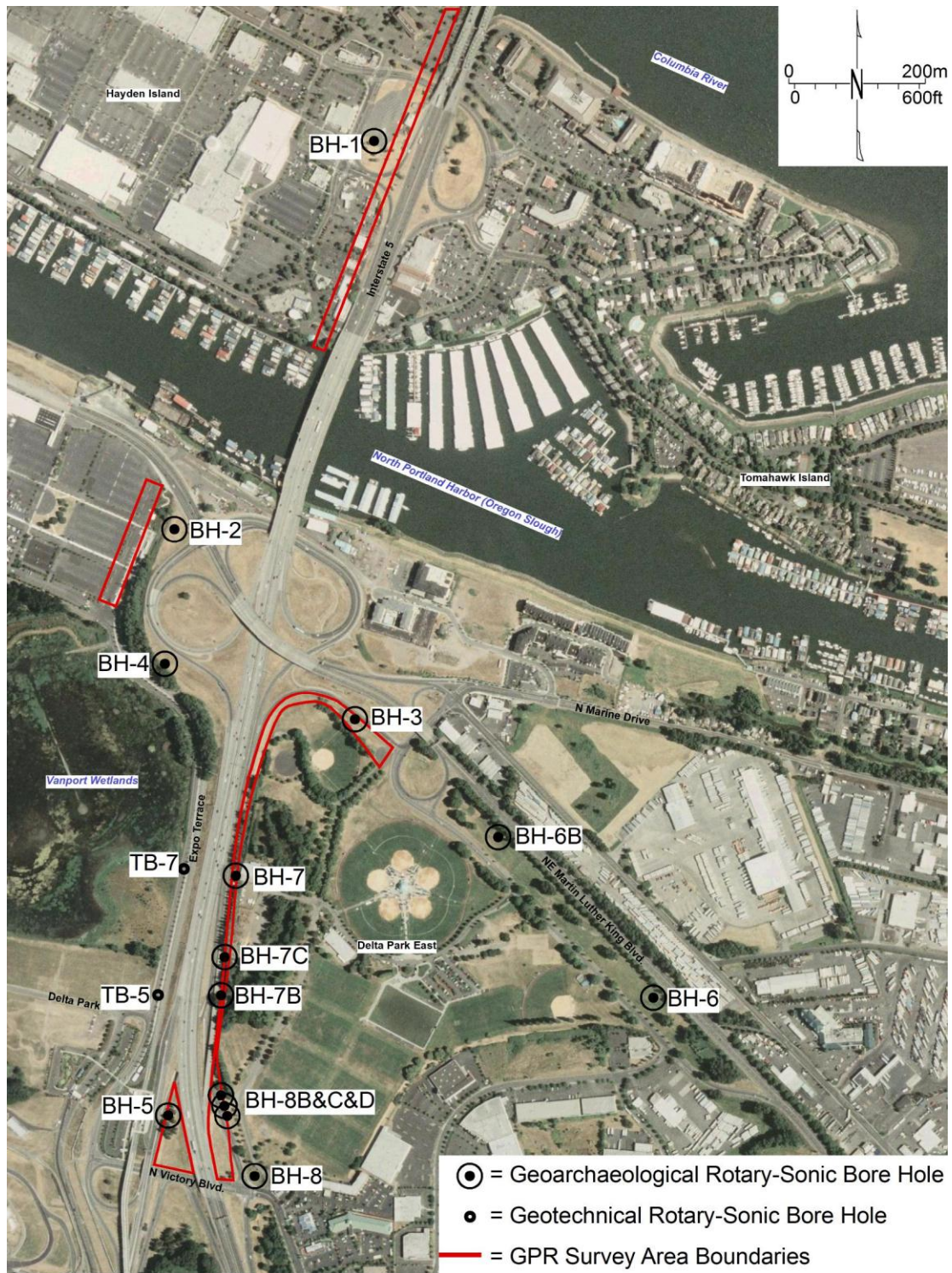
The value of deep coring lies primarily in the information it can provide about 1) the evolution over time of the landscape inhabited by prehistoric Native Americans on the Oregon shore, and 2) the *potential* for archaeological evidence of human occupation to be found. Due to the small (10-cm) diameter of the instrument, rotary-sonic drilling has only a small chance of encountering direct evidence (e.g., stone artifacts, cultural features) of prehistoric Native American occupation.

The rotary sonic boreholes were drilled in incremental sections (referred to as “runs”) of 5 to 20 feet. After each run, an approximately 4-inch-diameter continuous core was extruded (in 2.5 to 10-foot intervals) into plastic bags and secured in wooden core boxes. Following completion of the geoarchaeological drilling, two additional rotary-sonic boreholes drilled as part of the geotechnical investigations (TB-5 and TB-7) were subjected to the same field and laboratory procedures.

Core sections from twelve of the geoarchaeological boreholes (two boreholes underwent partial collapse due to driller’s error and were abandoned) and the two geotechnical boreholes were processed and analyzed under controlled laboratory conditions. Each of the 550 sections containing Holocene alluvium was split lengthwise; one half was examined and sub-sampled for geoarchaeological analyses, while the other half was subjected to archaeological analysis involving screening for cultural materials through 1/8-inch mesh.

No evidence of prehistoric Native American activity was found in either the archaeological samples examined through rigorous screening or in the samples subjected to close inspection during geoarchaeological analyses.

Exhibit 3-2. Map of GPR Survey Areas and Geoarchaeological Borehole Locations on the Oregon Shore



Each geoarchaeological core split was photographed, described with regard to lithology, grain size (sand and gravel), moist color, and presence/absence and type of organics, and sub-sampled for organics and tephra, if present. Core splits from selected boreholes (BH-1 through 3, 6, 7, and 8D) were also sub-sampled for microfossils (pollen), dry bulk density, and sand-fraction mineralogy.

The rotary-sonic coring served to "ground-truth" the findings of the earlier GPR surveys, confirming the presence of deep fill on the ODOT parcels. Fill deposits in the CRC APE range from 1.9 m (6.2 ft) to 5.8 m (19.0 m) deep. The depth to the Pleistocene gravels ranged from 60.6 m (198.8 ft) in the borehole on Hayden Island, to 36.2 m (118.8 ft), 34.7 m (113.9 ft), and 33.9 m (111.3 ft) in boreholes just south of Oregon Slough, to 40.0 m (132.6 ft) and 34.6 m (113.5 ft) in boreholes just north of Victory Boulevard.

Volcanic tephra deposits, ranging from one to as many as three layers from separate volcanic eruptions, were observed in the boreholes. The most common tephra represented is from the climactic eruption of Mount Mazama at present-day Crater Lake with a calendrical age of 7,627 cal BP (Zdanowicz et al. 1999; Bacon and Lanphere 2006). Identification of this tephra as originating from Mount Mazama was confirmed by microprobe analysis conducted at Washington State University (Foit 2010). Based on depth below surface and radiocarbon dating, other tephra layers represented appear to correlate with Mount St. Helens Set W deposited around 500 BP, and Mount St. Helens Set Y deposited between 3,900 and 3,300 BP (Mullineaux 1996).

Materials recovered from the borehole samples submitted to Beta Analytic for radiocarbon analysis have returned a suite of ten radiocarbon dates (reported here as 2 sigma values). The earliest radiocarbon date of 10,740-11,190 cal BP (2 sigma) was obtained from a depth of 55.6 m (182.5 ft) below surface in BH-1. The depositional period of the Mazama ash is well constrained in BH-3 by radiocarbon dates of 6,900-7,170 cal BP from 18.6 m (61.1 ft) and 7,700-7,940 cal BP from 23.3 m (76.4 ft) below surface. Other early radiocarbon dates include 8,590-8,980 cal BP from a depth of 32.4 m (106.3 ft) in BH-3, and 8,600-9,000 cal BP from a depth of 31.7 m (104.0 ft) in TB-7. The radiocarbon dates from the boreholes are currently being correlated with the volcanic tephra deposits to develop a tephrochronology for the Oregon shore.

The encountering of tephra layers on the Oregon shore is significant, as it indicates the preservation of flood plain muds in some areas that have not been disturbed by erosive channel migrations over at least the last 7,000 years, and possibly over an even longer time span extending back to perhaps 9,000 to 11,000 years BP. This situation raises the likelihood that intact archaeological deposits associated with Native American activity are preserved within the flood plain muds on the south shore of the Columbia River.

3.6 Results of Investigations on the Washington Shore

The CRC APE on the Washington shore is divided by roadways associated with the I-5/SR 14 interchange into a number of small parcels. For ease in identification, an alpha-numeric system was developed, with the areas designated "W1" through "W24" (Exhibit 3-3 and Exhibit 3-4). The bulk of these areas are WSDOT-owned lands. A number of additional non-WSDOT parcels (e.g., City of Vancouver, U.S. Army, National Park Service, and private properties) were initially included in this designation system. Some of these areas were not subjected to archaeological investigations either because they were no longer identified as affected parcels or because landowners declined access. The designations for areas within the VNHR were later changed to VNHR Area #1 through VNHR Area # 5, where investigations were conducted by NPS archaeologists.

An area summary of the archaeological investigations conducted to date for the CRC project is presented in Exhibit 3-5. A breakdown of the specific field methods employed (e.g., manual excavations of probes and/or test units, mechanical trenching), the number of cultural features recorded (if present), and number of artifacts recovered during the archaeological investigations for the CRC project is presented in Exhibit 3-6.

3.6.1 Site Nomenclature

The way in which archaeological sites were defined and designated years ago differs from how they are recorded today. This difference is highlighted, in particular, in the designation and management of archaeological resources in the CRC APE on the Washington shore, on the east side of I-5.

Archaeological research on the Washington shore in the CRC project area began with excavations at the site of HBC Fort Vancouver from 1947 to 1952 (Caywood 1955). Initial excavations in Kanaka Village were undertaken in 1968 and 1969 (Kardas 1971). In 1974 and 1975 extensive excavations were undertaken in advance of the reconstruction of the intersection of I-5 and SR 14 (Chance and Chance 1976; Chance et al. 1982; Carley 1982).

It was during these latter investigations in the late 1970s, that site numbers were first assigned to archaeological properties. The sites recorded at that time include 1) the HBC - USA Trash Dump Site, better known as the Pond (45CL47); 2) Vancouver Barracks (45CL162H), 3) Fort Vancouver National Historic Site (45CL163H); 4) Old Apple Tree (45CL164H); and 5) Kanaka Village (45CL300H). These sites are now within the VNHR created in 1996 (Owens et al. 2007).

Although recorded as *archaeological sites*, these designations actually referred more to historical sites (e.g., Fort Vancouver National Historic Site, Vancouver Barracks) and historical landscape features (Pond, Old Apple Tree) rather than to specific archaeological deposits. To a considerable degree, HBC Fort Vancouver, Kanaka Village, and Vancouver Barracks occupied the same landscape and, not surprisingly, these "historical sites" exhibit a considerable degree of spatial overlap. At the time these sites were recorded, defining archaeological site boundaries was not a high priority, and little or no information was provided about site extents and boundaries on the original site record forms.

Today, the recording of any archaeological site begins with identification of its location and extent, which includes the delineation of the horizontal and vertical boundaries of the archaeological deposits. This basic information is required for effective management of archaeological sites by property owners. One of the primary objectives of the discovery and evaluation phases of archaeological fieldwork undertaken for the CRC project was the identification of any archaeological sites, including delineation of the horizontal and vertical extent of any archaeological deposits, present in the CRC APE.

The HERITAGE team of archaeologists conducted investigations in 18 separate areas on the Washington shore. Sufficient archaeological remains were found to warrant the formal recording of archaeological sites with DAHP in 17 of these areas (all except W24). The 17 archaeological sites recorded by HERITAGE (45CL910 to 45CL926) all refer to archaeological deposits on WSDOT lands.

Six archaeological sites recorded in the WSDOT parcels east of the I-5 right-of-way overlap with the boundaries of 45CL300 as proposed in 1980 (Exhibit 3-7). As originally assigned in the late 1970s, this site number referred to a relatively small area east of I-5 and north of SR 14 known as Kanaka Village, described as "an historic village; housing for majority of Hudson's Bay Co

employees at Fort Vancouver" (Anonymous n. d.). In a Determination of Eligibility (DOE) document for "Fort Vancouver - Kanaka Village" prepared in 1980 in conjunction with proposed improvements to the I-5/SR 14 interchange, the area of 45CL300 was greatly expanded to include lands administered by NPS, the U.S. Army, and WSDOT to be affected by this project (Smith 1980).

It appears that all lands east of I-5 that potentially contained archaeological resources and that faced a potential effect by the WSDOT project were grouped into a single site designation comprising over 50 acres, most likely to simplify the processing of compliance paperwork. The boundaries of 45CL300 were based on land ownership within an anticipated construction impact area rather than any delineation of the extent of archaeological deposits by means of archaeological fieldwork. The expanded boundaries of 45CL300 overlap with those of the Fort Vancouver National Historic Site (45CL163H) and completely envelop the Pond (45CL47). The designation 45CL300 continues to be used by NPS today. Encompassed under this designation are archaeological resources ranging in age from prehistoric to historic, with significant historical archaeological remains from HBC Fort Vancouver, Kanaka Village, the U.S. Army Quartermaster's Depot, and later U.S. Army activities through the Spanish-American War, World War I, and World War II eras.

In a similar way, the current recording of archaeological sites on WSDOT property, noted above, was undertaken for a specific purpose, namely for the management of archaeological sites that may be affected by construction of the CRC project. The site designations obtained from DAHP refer to specific archaeological deposits on WSDOT property. The strict definition of these sites is intended to allow for directed management, and if needed, mitigation, to maintain compliance with the NHPA Section 106 process for the CRC project.

The approach implemented for WSDOT facilitates the treatment and management of each recorded archaeological site. At the time of the field investigations, the CRC project's effects on the WSDOT parcels were not yet known. The approach implemented avoids the messiness of having the same site number applied to archaeological deposits and features in different WSDOT parcels that will be differentially affected by the CRC project (see discussion of site 45CL300 above).

Although there is some slight overlap with the *administrative* boundaries of 45CL300, the recording of the archaeological deposits on WSDOT property as separate archaeological sites is consistent with the precedent set by the previous inclusion of portions of multiple sites with overlapping boundaries under the designation 45CL300 (as well as the overlapping of the boundaries of other archaeological sites within the VNHR). The recognition of the archaeological sites on WSDOT property with individual DAHP site numbers brings clarity to the management obligations of the agency owner and underscores the State of Washington's responsibility for managing these cultural resources.

Exhibit 3-3. Areas Investigated in Southern Portion of CRC APE on the Washington Shore

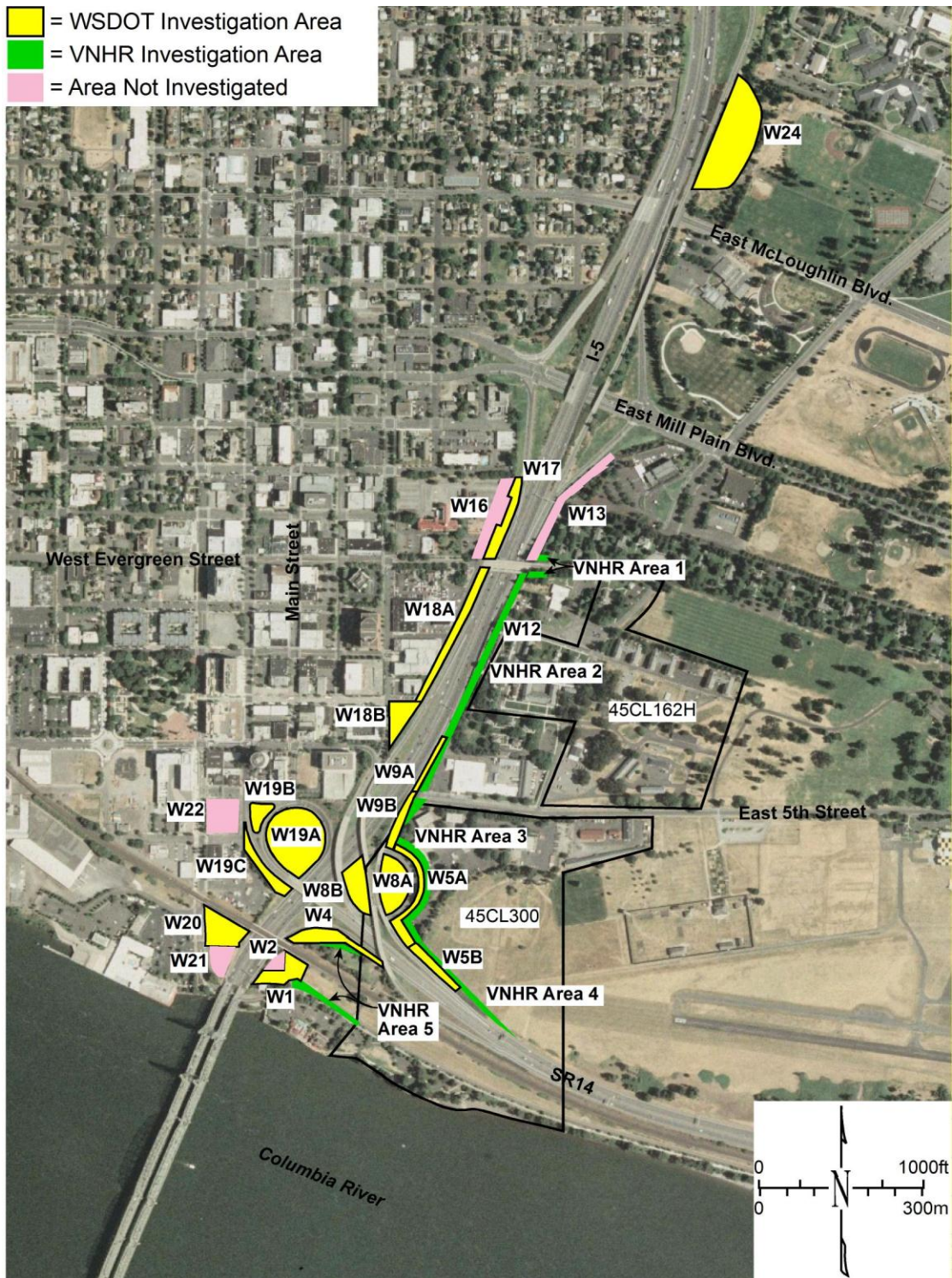


Exhibit 3-4. Areas Investigated in Northern Portion of CRC APE on the Washington Shore

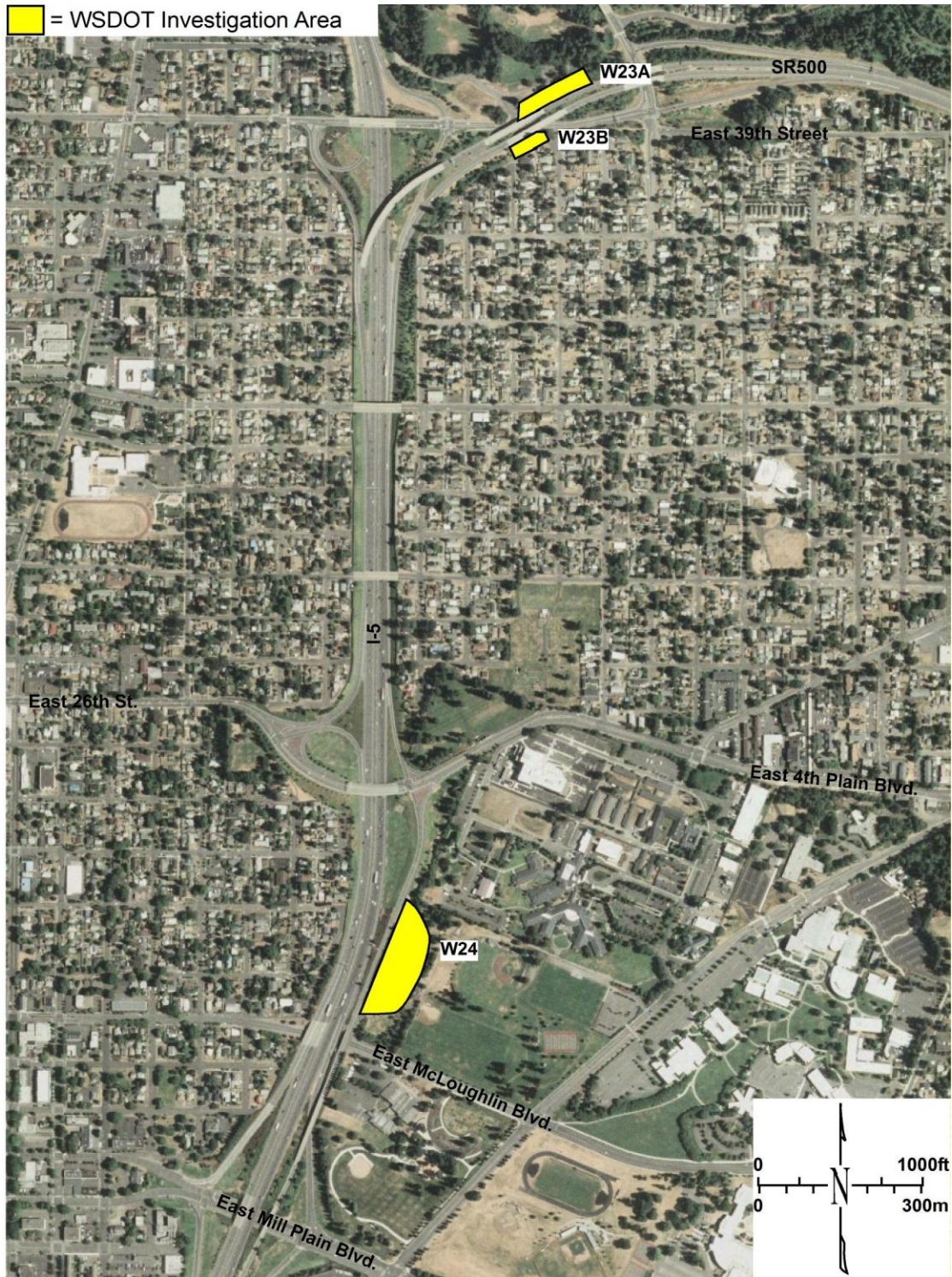


Exhibit 3-5. Summary of Archaeological Investigations by Area on the Washington Shore

Area Designation	Site Number ^a	Archaeological Investigator	Significant Archaeology	Comments
W1	45CL910	HERITAGE Appendix 1C	Yes	Only eastern portion tested; western portion not accessible
W2		None		No access—BNSF/City of Vancouver property
VNHR 5	45CL163H ^b	NPS Appendix 1D	Yes	Formerly W3
W4	45CL911	HERITAGE Appendix 1C	No	
W5A	45CL912	HERITAGE Appendix 1C	No	
W5B	45CL913	HERITAGE Appendix 1C	No	
VNHR 4	45CL300 ^b	NPS Appendix 1D	Yes	Formerly W6
VNHR 3	45CL300 ^b	NPS Appendix 1D	Yes	Formerly W7
W8A	45CL914	HERITAGE Appendix 1C	Yes	
W8B	45CL915	HERITAGE Appendix 1C	Undetermined	Covered by deep fill for SR 14 on & off ramps
W9A	45CL916	HERITAGE Appendix 1C	No	
W9B	45CL917	HERITAGE Appendix 1C	Yes	
VNHR 2	45CL162H ^b	NPS Appendix 1D	Yes	Formerly W10, W11, W12
W13			Undetermined	Fieldwork pending; within former Post Cemetery
VNHR 1	45CL160H ^b	NPS Appendix 1D	Yes	Formerly W14
W15		None		PUD property
W16		None		Academy property
W17	45CL918	HERITAGE Appendix 1C	No	
W18A	45CL919	HERITAGE Appendix 1C	No	
W18B	45CL920	HERITAGE Appendix 1C	Yes	
W19A	45CL921	HERITAGE Appendix 1C	Yes	
W19B	45CL922	HERITAGE Appendix 1C	Yes	
W19C	45CL923	HERITAGE Appendix 1C	No	
W20	45CL924	HERITAGE Appendix 1C	Yes	
W21		None		No access—Red Lion property
W22		None		No access—private parcel
W23A	45CL925	HERITAGE Appendix 1C	No	
W23B	45CL926	HERITAGE Appendix 1C	Yes	
W24		HERITAGE Appendix 1C	No	No archaeological remains found

a Site number is a trinomial in which 45 refers to Washington, CL refers to Clark County, and the final three digits are assigned according to the order in which archaeological sites are recorded by DAHP.

b Correlation of VNHR Areas with previously recorded archaeological sites suggested by the National Park Service (O'Rourke et al. 2010:286-287).

Exhibit 3-6. Summary of Archaeological Investigations for the CRC Project on the Washington Shore

CRC Area	Site Number	Mechanical Trenches (No./Total Length)	Probes^a	Test Units^b	Cultural Features	Artifacts
HERITAGE Investigations						
W1	45CL910	3 / 80.5 m		1	1	403
W4	45CL911	2 / 128.0 m	7			17
W5A	45CL912	17 / 132.3 m	6		5	153
W5B	45CL913	5 / 118.5 m	1	13		1,322
W8A	45CL914	12 / 41.9 m		2	2	217
W8B	45CL915	1 / 42.0 m				30
W9A	45CL916	1 / 58.0 m	11	14	1	502
W9B	45CL917	1 / 82.0 m	11	6	11	933
W17	45CL918	(None)	40		2	1,850
W18A	45CL919	1 / 77.0 m	14			23
W18B	45CL920	11 / 201.7 m		5	18	3,212
W19A	45CL921	12 / 666.1 m		4	17	2,377
W19B	45CL922	3 / 103.0 m		4	3	2,336
W19C	45CL923	5 / 44.1 m				72
W20	45CL924	5 / 102.0 m	3		1	12
W23A	45CL925	4 / 85.0 m			1	7
W23B	45CL926	3 / 44.0 m			2	1,178
W24	no site	10 / 247.4 m				0
Subtotals:		96 / 2,253.5 m	93	49	64	14,644
NPS Investigations						
VNHR 1	45CL160H	(None)	5	5	1	1,457
VNHR 2	45CL162H	19 / 43.1 m	11	1		2,467
VNHR 3	45CL300	39 / 257.4 m		22	23	8,778
VNHR 4	45CL300	(None)	5	11	3	10,285
VNHR 5	45CL163H	21 / 58.4 m	4	13	9	11,027
Subtotals:		79 / 358.9 m	25	52	36	34,014
Grand Totals:		175 / 2,612.4 m	118	101	100	48,658

a The term "Probe" encompasses auger holes (25-cm diameter), round probes (30-cm diameter), and shovel probes (50 x 50 cm).

b "Test Units" generally measure 1 x 1 m.

Exhibit 3-7. Concordance of Sites Recorded in WSDOT Parcels on East Side of I-5/SR 14 Interchange with Previously Recorded Sites in VNHR

WSDOT Parcels	CRC Recorded Site	Previously Recorded Site Number	Comments
W1	45CL910	None	45CL910 is a newly-recorded site on WSDOT property
W4	45CL911	45CL300 (partial)	45CL911 is a newly-recorded site on WSDOT property; the western line of the administrative boundary of 45CL300 cuts through this site
W5A	45CL912	45CL300	45CL912 extends along the narrow strip of WSDOT property bordering the I-5 exit ramp to downtown Vancouver; it is adjacent on the west to U.S. Army property within the administrative boundaries of 45CL300
W5B	45CL913	45CL300 & 45CL47	45CL913 extends across WSDOT property on the north side of SR 14 within the administrative boundaries of 45CL300; no evidence of the Pond (45CL47) was found on WSDOT property
W8A	45CL914	45CL300	45CL914 is on WSDOT property within the eastern half of the circle of the I-5 exit ramp to downtown Vancouver within the administrative boundaries of 45CL300
W8B	45CL915	45CL300 (partial)	45CL915 is on WSDOT property in the western half of the circle of the I-5 exit ramp to downtown Vancouver; the western line of the administrative boundary of 45CL300 cuts through this site
W9A	45CL916	None	45CL916 is a newly recorded site, in the narrow strip of WSDOT property adjacent on the west to the FHWA property
W9B	45CL917	45CL300	45CL917 is in the narrow strip of WSDOT property adjacent on the west site of the U.S. Army property within the administrative boundaries of 45CL300

3.6.2 Prehistoric Archaeology

A relatively small number of stone artifacts, characteristically associated with Native Americans, were recovered by both the HERITAGE and NPS archaeologists. The finding of these materials is consistent with the recovery of stone tools and debitage during previous archaeological investigations in the former area of Kanaka Village at Fort Vancouver.

In the reports on previous investigations, stone artifacts are regularly assumed to represent evidence of activity in the prehistoric period. This has been the case even when these materials 1) are not temporally diagnostic and 2) even when they are found in the same excavation levels and strata with items of Euroamerican manufacture associated with Native Americans visiting or residing in Kanaka Village in the historic period.

Distinguishing evidence of prehistoric activity from activity by Native Americans in the historic period is made difficult by the sedimentary context in which archaeological remains occur along the Washington shore. In comparison to the Oregon shore, relatively little deposition of sediment has occurred on the Washington shore during the Holocene. As a result, stone artifacts that are potentially prehistoric in age more often than not occur in the same shallow sediments as historic period materials.

For the purpose of this report, the stone artifacts found during the investigations for the CRC project are discussed here under prehistoric archaeology. This treatment is consistent with evidence that there was, in fact, some earlier use during the prehistoric period of the area along the north shore that was later the setting of Kanaka Village. As shown below, however, the contexts in which most of the stone tools and debitage were found, points to the conclusion that

most of these artifacts reflect manufacture and use after the time of historic contact by the inhabitants of Kanaka Village.

3.6.2.1 Previous Findings of Stone Artifacts

Although a “Prehistoric/Contact-Period Native American Character Area” was included in the Vancouver National Historic Reserve Historic District nomination (Owens et al. 2007), no prehistoric archaeological sites have been formally recorded on the Washington shore within the CRC APE. However, one underwater archaeological site identified as prehistoric in age by its recorder has been recorded offshore in the Columbia River. This site may extend into the CRC APE. The Benoit Site (45CL401) is an artifact scatter situated 15 feet offshore on a shelf in the river, resting 18 to 22 feet below the surface (Stenger 1988b). Stone artifacts, characteristically associated with Native Americans, observed at this site include net sinkers and net weights, pre-forms, and lightly worked cobbles. A resurvey of the shoreline in 2007 concluded that the area in which the stone artifacts were observed is part of a “large, mixed, component site,” characterized primarily by artifacts representing the secondary discard of materials by the HBC and U.S. Army Quartermaster’s Department (Marcotte and Wilson 2007:19). Although this site has not been formally evaluated, the preponderance of HBC- and U.S. Army-related artifacts suggests that the cultural materials at this underwater location likely contribute to the significance of the VNHR District.

Although no prehistoric archaeological sites have been formally recorded on the north shore of the Columbia River within the CRC APE, investigations over the years have recovered stone tools in contexts that seem to indicate evidence of prehistoric activity in the area of the future site of HBC Fort Vancouver, Kanaka Village, and the U.S. Army’s Vancouver Barracks. Most of this evidence has been found in the Riverside and Pond Areas (sometimes known as the HBC Riverside Complex), (Chance and Chance 1976:28, 43, 246-247), and in the strip of ground between SR 14 and the railroad berm (Carley 1982:251). However, with the possible exception of the lower deposits in the Pond, and the recovery of 11 stone items below historical materials in a single 50- by 50-centimeter probe excavated for the Land Bridge project (Wilson 2005:27, 29), the stone tools thought to represent prehistoric occupation have not been found in clearly defined strata in which historical artifacts are absent.

The most compelling evidence of prehistoric occupation has been found in the form of broad-necked projectile points. Of the 40 points illustrated in earlier reports, that are classifiable to some degree, approximately 50 percent appear to be large broad-necked points (some may have served as hafted knives) associated with the atlatl and dart weapon system, which in the Portland Basin was predominant from approximately 600 BC to AD 200 (Pettigrew 1981). The largest numbers of broad-necked points were found in the area between SR 14 and the river bank (Chance and Chance 1976:246-247; Carley 1982:261, Figure 135). The recovery of broad-necked projectile points strongly points to occupation of this area in prehistoric times.

The remaining 50 percent of the projectile points reported are narrow-necked specimens used with the bow and arrow. These points have also been found in the area between SR 14 and the river bank, as well as elsewhere on the Washington shore. Narrow-necked points were made over at least the last 1,500 years (Pettigrew 1981). In view of this long time span, most of the narrow-necked points found probably represent additional evidence of prehistoric (rather than post-contact) activity in the area. These points continued to be made into the historic period, and some specimens may have been introduced by Native Americans after the establishment of Fort Vancouver and Kanaka Village.

By all accounts, the great majority of stone artifacts found along the north shore of the Columbia River have been recovered in association with items of Euroamerican manufacture introduced after historic contact. In some cases, stone artifacts were found in direct association with historical materials (e.g., on the floors of houses in Kanaka Village), and thus were associated with Native Americans who settled near the HBC stockade (Kardas 1971; Thomas and Hibbs 1984). In other cases, stone artifacts found outside the known distribution of Kanaka Village houses have been interpreted as associated with temporary encampments occupied by Native Americans visiting HBC Fort Vancouver (Thomas 1992:4).

3.6.2.2 CRC Findings of Stone Artifacts

Nineteen stone items indicative of Native American activity were recovered from WSDOT parcels in the CRC APE (Exhibit 3-8). Three of these items are tools, including one tip fragment from a chert biface that might have served as a projectile point, one chert scraper edge fragment, and one chert uniface,. The remaining 16 specimens are debitage, of which 14 are chert and 2 are basalt.

Exhibit 3-8. Stone Tools and Debitage from WSDOT Sites and VNHR Areas

CRC Area	Site Number/ Location	Unit	Level ^a	Stratum ^b	Artifact Description
<i>HERITAGE Investigations</i>					
W5A	45CL912	SP4	9	A horizon	chert biface tip (proj. point?) (n=1)
W5B	45CL913	TU-A	5	Bw horizon	chert flake fragments (n=2)
	45CL913	TU-B	1	Mixed fill	chert uniface (n=1)
	45CL913	TU-C	5	Bw horizon	chert flake fragment (n=1)
	45CL913	TU-F	3	A horizon	basalt primary cortex flake (n=1)
	45CL913	TU-G	1	A horizon	chert flake fragments (n=2)
	45CL913	TU-K	7	Mixed fill	chert heat spall fragment (n=1)
W9A	45CL916	RP4	1	Fill (Stratum 1)	chert scraper edge fragment (n=1)
W9B	45CL917	SP2	6	Fill	chert broken flake (n=1)
	45CL917	SP2	7	Fill/Bw horizon	chert angular debris (n=1)
	45CL917	SP4	4	Fill	basalt flake fragment (n=1)
	45CL917	SP4	6	Fill	chert flake fragment (n=1)
	45CL917	SP5	5	Fill	chert primary cortex flake (n=1)
	45CL917	SP5	5	Fill	chert complete flake (n=1)
	45CL917	SP5	5	Fill	chert angular debris (n=1)
	45CL917	SP5	5	Fill	chert split nodule (n=1)
	45CL917	RP12	7	Fill	chert flake fragment (n=1)
Subtotals:					3 tools, 16 pieces debitage
<i>NPS Investigations</i>					
VNHR #1		TU1-01	2	IIc	Flake shatter (n=1)
VNHR #3	ca. 1840 Tayenta's House	TU3-02	3	III	Flake shatter (n=1)
	ca. 1840 Tayenta's House	TU3-03	4, 5, 6	IIa	Flake tool (n=1)
		TU3-04	2	IIa	Flake tool (n=1)
	ca. 1840 Tayenta's House	TU3-06	2	IIa/III	Core (n=1)

CRC Area	Site Number/ Location	Unit	Level^a	Stratum^b	Artifact Description
	ca. 1840 Tayenta's House	TU3-06	3	III/IV	Flake tool (n=1)
	ca. 1840 Tayenta's House	TU3-06	3	III/IV	Angular shatter (n=1)
	ca. 1840 Tayenta's House	TU3-06	3	III/IV	Flakes (n=2)
	ca. 1840 Tayenta's House	TU3-08	4	III	Angular shatter (n=1)
	ca. 1840 Kanaka House	TU3-12	5	IIa	Flake (n=1)
	ca. 1840 Kanaka House	TU3-14	2	IIc	Core (n=1)
		TU3-17	4	IIc	Flake (n=1)
	ca. 1859 Quartermaster's Stable Building	TU3-19	6, 7	IIc	Flake tool (n=1)
	ca. 1859 Quartermaster's Stable Building	TU3-20	5	IIc	Flake tool (n=1)
	ca. 1892 U.S. Army Stable Building	Trench 3-39b	1	N/A	Angular shatter (n=1)
VNHR #4	HBC Pond	ST4-04	9	IIc	Flake tool (n=1)
	HBC Pond	ST4-04	9	IIc	Flake shatter (n=1)
	ca. 1840 House 4B	TU4-01	3	IIc/III	Flake tool (n=1)
	ca. 1840 House 4B	TU4-01	4	III	Flake tool (n=1)
	ca. 1840 House 4B	TU4-02	2	III	Biface tool (n=1)
	ca. 1840 House 4B	TU4-02	2	III	Angular shatter (n=4)
	ca. 1840 House 4B	TU4-02	2	III	Flake shatter (n=1)
	ca. 1840 House 4B	TU4-02	3	III	Flaked tool fragment (n=1)
	ca. 1840 House 4B	TU4-02	3	III	Flake shatter (n=1)
	ca. 1840 House 4B	TU4-02	3	III	Flake (n=2)
	ca. 1840 House 4B	TU4-02	4	III	Flake (n=1)
	ca. 1840 House 4B	TU4-03	3	III	Projectile point (n=1)
	ca. 1840 House 4B	TU4-03	3	III	Flake (n=1)
	ca. 1840 House 4B	TU4-03	4	III	Flake shatter (n=1)
	ca. 1840 House 4B	TU4-03	5	III	Angular shatter (n=1)
	ca. 1840 House 4B	TU4-04	4	IIa/III	Flakes (n=2)
	ca. 1840 House 4B	TU4-04	5	IIa/III	Flakes (n=7)
	ca. 1840 House 4B	TU4-04	5	IIa/III	Angular shatter (n=2)
	ca. 1840 House 4B	TU4-04	5	IIa/III	Flake shatter (n=1)
		TU4-05	2	IIc	Flake tool (n=1)
		TU4-05	2	IIc	Angular shatter (n=1)
		TU4-06	3	IIa/IV	Angular shatter (n=1)
		TU4-06	3	IIa/IV	Flake shatter (n=2)
		TU4-06	3	IIa/IV	Flake (n=1)
		TU4-06	4	III/IV	Cobble tool (n=1)
		TU4-08	1	I/IIc	Flake tool (n=1)
		TU4-08	4	IIa	Flake shatter (n=1)
		TU4-08	4	IIc	Flake (n=1)
		TU4-08	5	III	Flakes (n=2)
		TU4-08	6	III	Flake tool (n=1)

CRC Area	Site Number/ Location	Unit	Level ^a	Stratum ^b	Artifact Description
	ca. 1840 House 4B	TU4-10	2	IIb/III	Flake (n=1)
	ca. 1840 House 4B	TU4-10	4	III	Flake tools (n=2)
	ca. 1840 House 4B	TU4-10	4	III	Projectile point (n=1)
	ca. 1840 House 4B	TU4-10	4	III	Flakes (n=2)
	ca. 1840 House 4B	TU4-10	5	III	Angular shatter (n=1)
	ca. 1840 House 4B	TU4-10	6	III/IV	Flake (n=1)
	ca. 1840 House 4B	TU4-11	3	IIc	Flakes (n=2)
VNHR #5		TU5-02	2	IIc	Core tool (n=1)
		TU5-02	3	IIc	Flake (n=1)
		TU5-02	3	IIc	Flake shatter (n=1)
		TU5-03	3	IIc	Flake shatter (n=1)
		TU5-03	5	IIc	Flake (n=1)
		TU5-03	7	IIc	Flake (n=1)
		TU5-05	2	III	Angular shatter (n=1)
		TU5-06	2	III	Projectile point (n=1)
		TU5-06	4	IV	Flake shatter (n=1)
		TU5-07	2	IIb	Flake (n=1)
		TU5-07	2	IIb	Flake shatter (n=1)
		TU5-07	3	IIb/IV	Flake shatter (n=1)
		TU5-08	2	III	Flake (n=1)
		TU5-08	3	III/IV	Core (n=1)
		TU5-08	3	III/IV	Flake shatter (n=1)
		TU5-08	3	III/IV	Flake (n=1)
	1859 U.S. Army Building	TU5-09	3	IIa	Flakes (n=2)
	1859 U.S. Army Building	TU5-09	3	IIa	Flake shatter (n=1)
	1859 U.S. Army Building	TU5-09	3	IIc	Flake shatter (n=1)
	1859 U.S. Army Building	TU5-09	6	IIa	Biface (n=1)
	1859 U.S. Army Building	TU5-09	6	IIa	Flakes (n=5)
	1859 U.S. Army Building	TU5-09	6	IIa	Flake shatter (n=3)
	1859 U.S. Army Building	TU5-09	7	IIa	Flake shatter (n=1)
	1859 U.S. Army Building	TU5-09	11	IIa	Flakes (n=2)
	1859 U.S. Army Building	TU5-09	11	IIa	Flake shatter (n=1)
	1859 U.S. Army Building	TU5-10	6	III	Projectile point (n=1)
	1859 U.S. Army Building	TU5-10	6	III	Angular shatter (n=1)
	1859 U.S. Army Building	TU5-11	6	IIa	Core (n=1)
	ca. 1874 Vancouver House Hotel	TU5-12	2	IIc	Angular shatter (n=1)
Subtotals:					22 tools, 81 pieces debitage, 4 cores
Grand Totals:					25 tools, 97 pieces debitage, 4 cores

a Levels are in 10-cm increments below surface

b Key to NPS Strata: I = Sod IIa = 19th Century fill IIb = 20th Century fill IIc = Mixed/undifferentiated fill
 III = Intact U.S. Army or HBC deposits IV = B Horizon V = C Horizon

These stone items were recovered from four different WSDOT sites. Seventeen of the 19 items were found in only two sites, 45CL913 (n=8) and 45CL917 (n=9). Site 45CL913 falls within the former area of Kanaka Village, while 45CL917 is situated slightly to the west and north of the

known location of Kanaka Village. Single specimens recovered from 45CL912 (the chert biface/projectile point tip) and 45CL916 (the chert scraper fragment) may have been associated with Native American activity around the village periphery.

In terms of specific contexts, all 19 stone artifacts recovered from the WSDOT sites were found in the same 10-centimeter excavation levels as historical materials. Consequently, all the stone tools and debitage found in the WSDOT sites were recovered from contexts suggesting association with Native American activity in the historic period.

Another 22 stone tools, 81 pieces of debitage, and 4 cores were recovered from VNHR Areas #1, #3, #4 and #5 (Exhibit 3-8). The 22 tools include 4 projectile points, one biface, one biface tool, 14 flake tools, one cobble tool, and one core tool. VNHR Area #4 (n=54) contained the highest number of stone items, followed by VNHR Area #5 (n=37), VNHR Area #3 (n=15), and VNHR Area #1 (n=1). Fire-cracked rock (n=206) was reported to be similarly distributed (Appendix 1D).

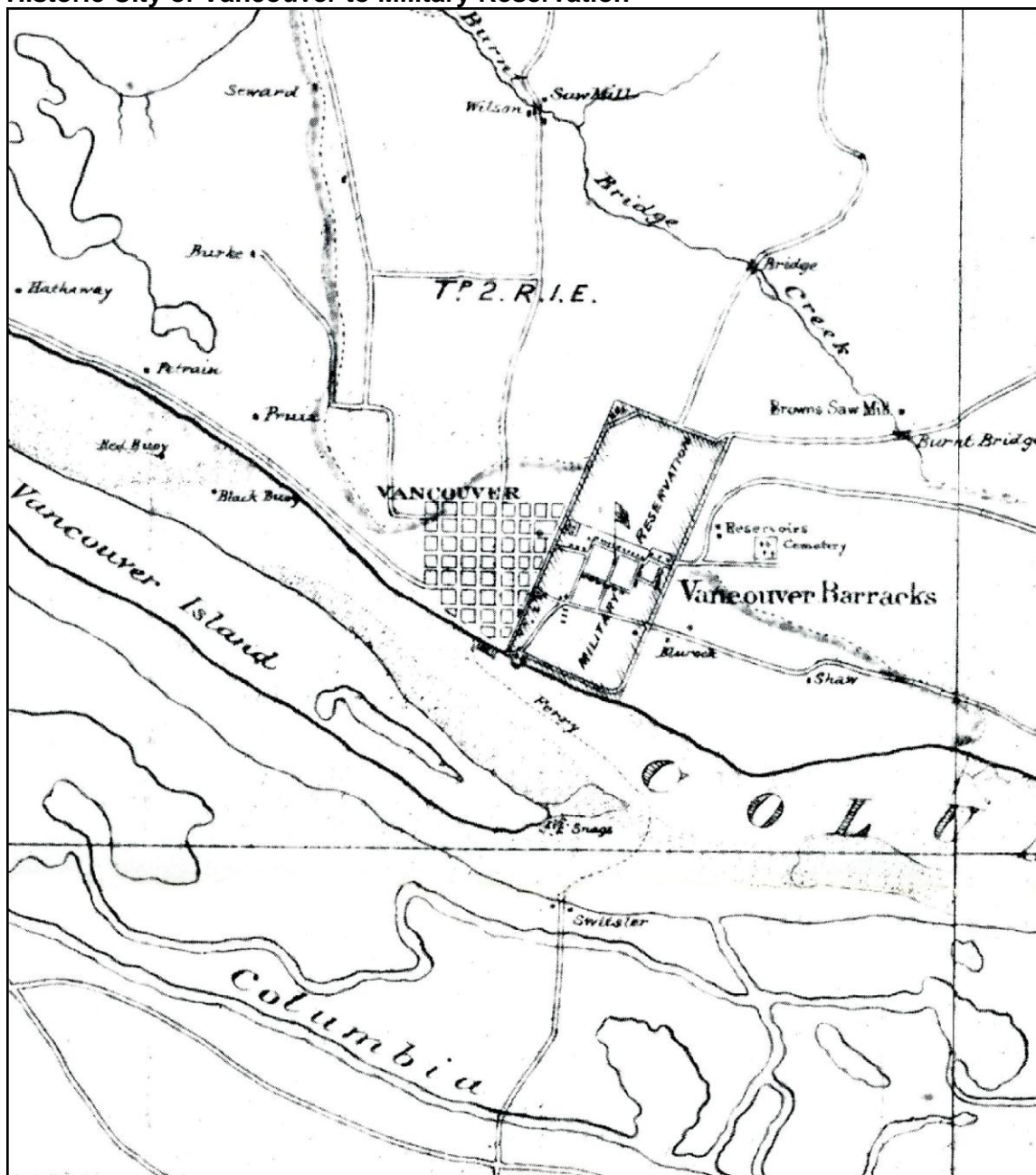
In terms of specific contexts in which stone artifacts were found in the VNHR areas, 43 are from fill deposits (IIa, IIb, IIc), 32 are from intact HBC or U.S. Army deposits (III), 21 are from deposits mixed with intact HBC or U.S. Army deposits (IIa/III, III/IV), 4 are from intact HBC or U.S. Army deposits mixed with B horizon (III/IV), 5 are from fill mixed with B horizon (IIa/IV, IIb/IV), one is from B horizon, and one is identified as N/A. Although the recovery of much of the debitage from fill deposits obscures any strong patterning, the distribution by stratigraphic units appears consistent with the results of previous investigations in indicating, that most of the stone tools recovered in the VNHR areas were found in association with historical materials.

Native Americans clearly were present in the CRC APE on the Washington shore over a long span of time, as indicated by the temporally-diagnostic projectile points recovered during previous investigations. To date, however, stone artifacts that very well may date to the prehistoric period have almost all been found along with items of Euroamerican manufacture introduced after historic contact. The data on the distribution of stone tools and debitage in the VNHR areas and the WSDOT parcels are generally complementary and follow the previously established pattern of concentration in the former area of Kanaka Village and vicinity. Although no prehistoric sites have been formally recorded on the Washington shore, the evidence clearly indicates the potential for prehistoric archaeological remains to be encountered, on land and in the river, during construction of the CRC project.

3.6.3 Historical Archaeology

The overwhelming majority of the archaeological evidence collected during the investigations for the CRC project on the Washington shore relates to activity and/or occupation in the historic period. This evidence includes archaeological remains that span more or less the entire history of this area, beginning with activity in and around Kanaka Village at HBC Fort Vancouver, and continuing with occupation by military personnel at the U.S. Army's Vancouver Barracks and by the civilian population in the Historic City of Vancouver (Exhibit 3-9). The alignment of I-5 extends across lands formerly within the City of Vancouver and U.S. Army Military Reservation. Archaeological remains associated with HBC Kanaka Village, the U.S. Army, and civilians in the Historic City of Vancouver all may potentially be encountered in the CRC APE. In practical terms, I-5 now serves as a boundary between the VNHR on the east and the City of Vancouver on the west. The archaeological and historical resources on the VNHR have been the subject of innumerable studies, culminating in placement of the VNHR Historic District on the National Register of Historic Places in 2007 (Owens et al. 2007).

Exhibit 3-9. Portion of Goethals' "A Map of the Country in the Vicinity of Vancouver Barracks, Washington Territory" (1883) showing relationship of Historic City of Vancouver to Military Reservation



In comparison, relatively few archaeological studies have been undertaken in, and relatively little has been written about, the Historic City of Vancouver, which can be defined as encompassing the core blocks in which the earliest settlement and development occurred. Settlement and development began on the bank of the Columbia River and generally spread northward along Main Street and the adjacent streets to the east (Broadway) and west (Washington and Columbia). For the purposes of the CRC project, the boundaries of the Historic City of Vancouver extend

north from the Columbia River to 19th Street, and from West Reserve Street on the east to the Union Pacific Railroad tracks and depot on the west.

Historic City of Vancouver is an appropriately descriptive and straight-forward name that evokes the age, nature, and spirit of the cultural resources associated with early settlement and development in the city. As outlined in a recent study, *Townsites: Historic Context and Archaeological Research Design* (HARD Townsites Team 2007), towns and cities have their own distinctive characteristics, contexts, and research themes. The archaeological record in the historic city is different in many ways from the archaeological record of the HBC and U.S. Army on the east side of I-5 (e.g., in terms of formation processes, material culture, architecture, nature of population represented) and warrants study for the information it can contribute about the historical settlement and development of Vancouver.

3.6.3.1 Application of National Register Criteria

Evaluation of the significance of the archaeological remains in Washington followed the standards and criteria outlined in *Guidelines for Evaluating and Registering Historic Archaeological Sites and Districts* (Townsend et al. 1993), *Guidelines for Evaluating and Registering Archaeological Properties* (Little et al. 2000), and 36 CFR 800.4(c).

Key elements in determining whether a property is eligible for listing on the NRHP are two-fold: 1) a property must meet at least one of the four National Register significance criteria, and 2) it must retain sufficient integrity of location, design, setting, materials, workmanship, feeling and association to convey its significance under the applicable criteria (Townsend et al. 1993; Little et al. 2000). Stated succinctly, significance + integrity = eligibility (Little et al. 2000).

Resources that are significant under criterion a (events and broad patterns of events), “must retain the ability to convey its association as the former repository of important information, the location of historic events, or the representation of important trends” (Little et al. 2000). The integrity of its physical environment is an important part in conveying the setting of events. Integrity of setting and feeling, along with location, design, materials, and association, is considered important under criterion a.

To qualify under criterion b (important persons), the property must be associated with individuals who are significant within a historic context. A property under criterion b must be illustrative of a person’s life, meaning that the property must be directly and strongly linked to the person and to the reason why that person is considered to be important within a local, state, or national historic context. Further, the property should have sufficient integrity such that the “essential features during its association with the person’s life are intact” (Little et al. 2000). If there are not physical cultural remains, then the setting must be intact to qualify under criterion b. Archaeological properties “need to be in good condition with excellent preservation of features, artifacts, and spatial relationships.” The *Guidelines* suggest that “an effective test is to ask if the person would recognize the property;” if not, then integrity may not be sufficient to qualify under criterion b (Little et al. 2000).

An archaeological site may qualify under criterion c (design, construction, and work of a master) if it retains “remains that are well-preserved and clearly illustrate the design and construction of the building or structure,” and exhibits distinctive characteristics of type, period, or method of construction (Little et al. 2000). As with the preceding criteria, integrity is an important part of the ability of the resource to convey its eligibility under this criterion. Integrity of design, materials, and workmanship are prime considerations under criterion c.

Archaeological sites are typically evaluated under criterion d (information potential) because of their ability to provide information important to history or prehistory. Location, design, materials, and association are generally the most relevant aspects of integrity for resources assessed under criterion d.

Archaeological resources identified during investigations in connection with the CRC project in 2009 were evaluated for significance under all four NRHP criteria. Cultural resources within the VNHR, situated on the east side of I-5, were previously evaluated for significance in 2004. At that time, resources in the VNHR Historic District were determined significant under criteria a, c, and d (Owens et al. 2007).

Archaeological investigations for the CRC project by HERITAGE archaeologists resulted in the recording of archaeological sites on 17 of the 18 WSDOT parcels (except W24). Eight of these 17 sites were assessed as National Register-eligible resources. NPS archaeologists identified 15 cultural resources located within the five VNHR areas that contribute to the significance of the VNHR Historic District. All of these resources were assessed as significant under National Register criterion d, as sites that “have yielded, or may be likely to yield, information important in prehistory or history.” Summary descriptions of the eligible archaeological sites are presented in Exhibit 3-10, and the locations of the eligible sites are shown in Exhibits 3-11 and 3-12.

In practical terms, WSDOT parcels identified as containing eligible archaeological sites are characterized by intact artifact-bearing strata and/or multiple cultural features with associated artifacts. Three parcels where only one cultural feature was documented (W1, W20, W23B) were assessed as eligible because 1) the discovery investigations were curtailed by legal boundary uncertainties and/or the presence of underground utilities, and 2) there is a high degree of likelihood that additional cultural features are present.

The same standards—intact artifact-bearing strata and/or multiple cultural features—also were applied to localities in the VNHR identified by NPS archaeologists as eligible. However, because the VNHR is already listed on the National Register, some localities in the VNHR were identified as eligible based on the former presence of buildings or features on historic maps, or because intact deposits were identified during earlier archaeological investigations, rather than the documentation of significant archaeological remains encountered during archaeological testing for the CRC project.

Six of the 17 sites recorded by HERITAGE archaeologists partially or wholly overlap with the boundaries of previously recorded site 45CL300 in the VNHR (Exhibit 3-7). Two of these six sites, 45CL914 and 45CL917, were assessed as containing National Register eligible archaeological resources that contribute to the significance of the VNHR Historic District.

The remaining four sites on WSDOT parcels, wholly or partially within the boundaries of 45CL300, do not meet the requirements for National Register eligibility identified by the National Park Service (Townsend et al. 1993; Little et al. 2000). Specifically, the four sites that do not meet NRHP requirements are characterized by 1) “temporally diverse culture material found in undifferentiated/mixed stratigraphic contexts or disturbed spatial associations and the absence of classifiable archaeological features,” and 2) “site formation processes that have severely compromised the physical integrity of the archaeological record” (Townsend et al. 1993:30). Consequently, these four sites do not contribute to the significance of the VNHR Historic District.

The NPS has recommended that certain archaeological resources in the VNHR may warrant consideration as significant under other National Register criteria in addition to criterion d. Specifically, resources in VNHR Area #1, VNHR Area #3, and VNHR Area #4 may be

significant under criteria a, b, or c. The presence of cultural resources on the VNHR that may be NRHP-eligible under criteria a, b, c, as well as d, reflects the relatively higher degree of integrity of the physical environment retained within the U.S. Army installation at Vancouver Barracks.

In comparison, none of the 17 archaeological sites recorded on the WSDOT parcels, including the 8 sites assessed as significant under criterion d, meets the requirements for significance under criteria a, b, or c. The inapplicability of criteria a, b, and c to sites on the WSDOT parcels is a direct result of the location of these parcels in the construction zone for I-5 and SR 14. The massive amount of earth-moving resulted in the widespread destruction of the native soils and natural setting in the I-5 and SR 14 corridors, destroying any sense of the quality of integrity required for cultural resources to be considered significant under criteria a, b, or c.

Exhibit 3-10. Summary Description of Archaeological Resources on the Washington Shore Assessed as Eligible Under NRHP Criterion D

CRC Area	Eligible Resource	Archaeological Resource Description^a
W1	45CL910	City Block 2 (418): Brick foundation/wall correlates with south wall of large building shown on 1884, 1888, 1890, and 1892 Sanborn maps. In another area, nineteenth and twentieth century cultural materials were recovered from apparently intact cultural deposits at 130 to 160 cmbs.
W8A	45CL914	Quartermaster's Depot: Two brick piers, with associated artifact-bearing deposits, were exposed. The piers are similar to those used to support late nineteenth and early twentieth century U.S. Army structures.
W9B	45CL917	Quartermaster's Depot Stable: Among the 11 cultural features documented were the concrete stable foundation corner and a concrete/brick wall and sidewalk from a wagon shed at the depot complex shown on military maps, as well as Sanborn Insurance maps from 1907 and 1911.
W18B	45CL920	City Block 26 (456): Among the 17 cultural features documented directly across Reserve Street from the Quartermaster 's Depot were 7 trash disposal burn pits containing late nineteenth and early twentieth century artifacts, as well as concrete/brick foundations from buildings shown on Sanborn Insurance maps from 1892 to 1949.
W19A	45CL921	City Blocks 4 (392) and 5 (391): Among the 18 cultural features documented on the west side of Main Street were numerous brick foundation/wall segments, a brick pier, and two trash disposal burn pits containing late nineteenth and early twentieth century artifacts.
W19B	45CL922	City Block 5 (391): The three cultural features found in this area at the southeast corner of 5th and Washington Streets included two trash disposal/burn pits and one burned structure deposit, all containing substantial quantities of late nineteenth and early twentieth century artifacts.
W20	45CL924	City Block 17 (370): A section of wall constructed of concrete blocks and a concrete floor uncovered deep below the surface correlate with a large building on the southwest corner of 2nd and Columbia Streets shown on the 1907 and 1911 Sanborn maps. Some 20th century cultural materials present. Augering located deeply buried wetland soils containing artifacts that trace the course of an historic slough farther to the south from where it is shown on the 1884, 1888, and 1890 Sanborn maps.
W23B	45CL926	City Block 1178: A single cultural feature, a trash disposal burn pit, uncovered on the south side of 39 th Street contained an abundance of artifacts from a domestic site dating from the last decades of the nineteenth and early decades of the twentieth century.
VNHR 1	Old Post Cemetery	A single cultural feature, a possible grave shaft, was encountered, and a human metatarsal was recovered, in the former area of the Old Post Cemetery. The cultural material consisted of nineteenth and twentieth century artifacts. The Old Post Cemetery was in use from the 1850s to 1883, when the cemetery was relocated.
VNHR #1 & #2	1879 Line Officers Quarters	Vancouver Barracks, Officers Row. Cultural materials consisted of nineteenth and twentieth century artifacts possibly associated with the architectural remains of an officer's quarters.

CRC Area	Eligible Resource	Archaeological Resource Description^a
VNHR #2	1851 Blacksmith Shop	Fort Vancouver/Vancouver Barracks, Quartermaster's Depot. Cultural material consisted of nineteenth and twentieth century artifacts.
VNHR #2	1859 Workshops	Fort Vancouver/Vancouver Barracks, Quartermaster's Depot. Discontinuous intact strata with cultural deposits. Cultural material consisting of nineteenth and twentieth century artifacts.
VNHR #3	1892 U.S. Army Stable	Fort Vancouver/Vancouver Barracks, Quartermaster's Depot. Two cultural features, a brick wall or foundation, and OP52B excavation units from Thomas and Hibbs (1984). The cultural material consisted of nineteenth and twentieth century artifacts.
VNHR #3	1859 Quartermaster's Stable	Fort Vancouver/Vancouver Barracks, Quartermaster's Depot. Three cultural features, two brick foundation piers, and wood structural elements. The cultural material consisted on nineteenth and twentieth century artifacts.
VNHR #3	1850 McLoughlin Road	Fort Vancouver/Vancouver Barracks. A single cultural feature, the 1850 road surface.
VNHR #3	1880s McLoughlin Road Tree Allée	Fort Vancouver/Vancouver Barracks. Five heritage trees dating to the 1880s.
VNHR #3	1840s HBC Village, Kanaka House	Fort Vancouver Village. Nine cultural features, a concrete post base, a pit, a wood footing or post with vertical orientation, burned soil with 19th century artifacts, Feature 71 footing from Thomas and Hibbs (1984), Feature 66 pit from Thomas and Hibbs (1984), Feature 71 footing from Thomas and Hibbs (1984), the Kanaka House 1981 excavation baulk, and the 1981 Thomas and Hibbs excavation unit. Abundant HBC village artifacts.
VNHR #3	1840s HBC Village, Tayenta's House	Fort Vancouver Village/Vancouver Barracks Quartermaster's Depot. Five cultural features, a wood board, a post and post hole, a post hole, a possible pit feature, and a railroad tie. The cultural material consisted of nineteenth and twentieth century artifacts. Intact nineteenth and twentieth century cultural deposits with abundant HBC Village artifacts.
VNHR #4	1840s HBC Village, House 4	Fort Vancouver Village. Intact nineteenth century deposits. Perimeter of HBC Village House 4/4B delineated. Abundant HBC Village artifacts.
VNHR #4	HBC Village Pond	Fort Vancouver/Vancouver Barracks Quartermaster's Depot. The cultural material consisted of nineteenth and twentieth century material in stratified deposits. The bottom of the pond deposits was not reached.
VNHR #5	1859 U. S. Army Building	Fort Vancouver/Vancouver Barracks Quartermaster's Depot. Six cultural features, a midden, a midden wood elements, an upper midden, a modern post hole, a lower midden wood elements, and a lower midden (bottom not reached). The cultural material consisted of nineteenth and twentieth century artifacts.
VNHR #5	1874 Vancouver House Hotel	City of Vancouver. Three cultural features, a midden, a modern trench, and a post remnant. The cultural material consisted of nineteenth and twentieth century artifacts.
VNHR #5	1826 Old Apple Tree	Old Apple Tree. The tree itself is not located within the CRC APE, and no archaeological excavations were conducted in its vicinity.

a See Appendix 1C and Appendix 1D for more information.

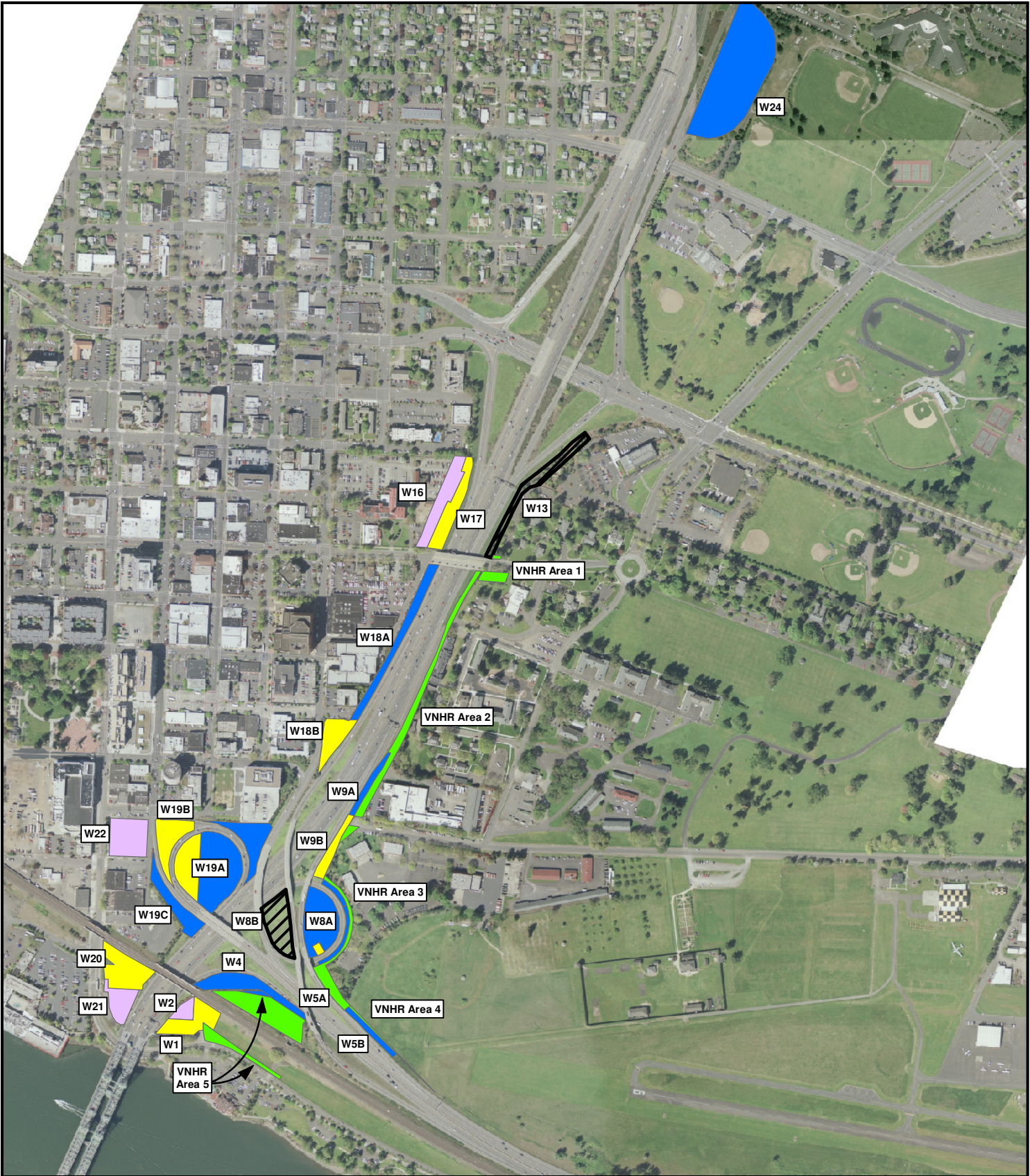


Exhibit 3-11. Significant Archaeological Resource Identified in the Southern Portion of the CRC APE on the Washington Shore



Area Found Not Significant
 Significant Not Determined

Significant WSDOT Site Area
 Area Not Investigated

Significant VNHR Site Area

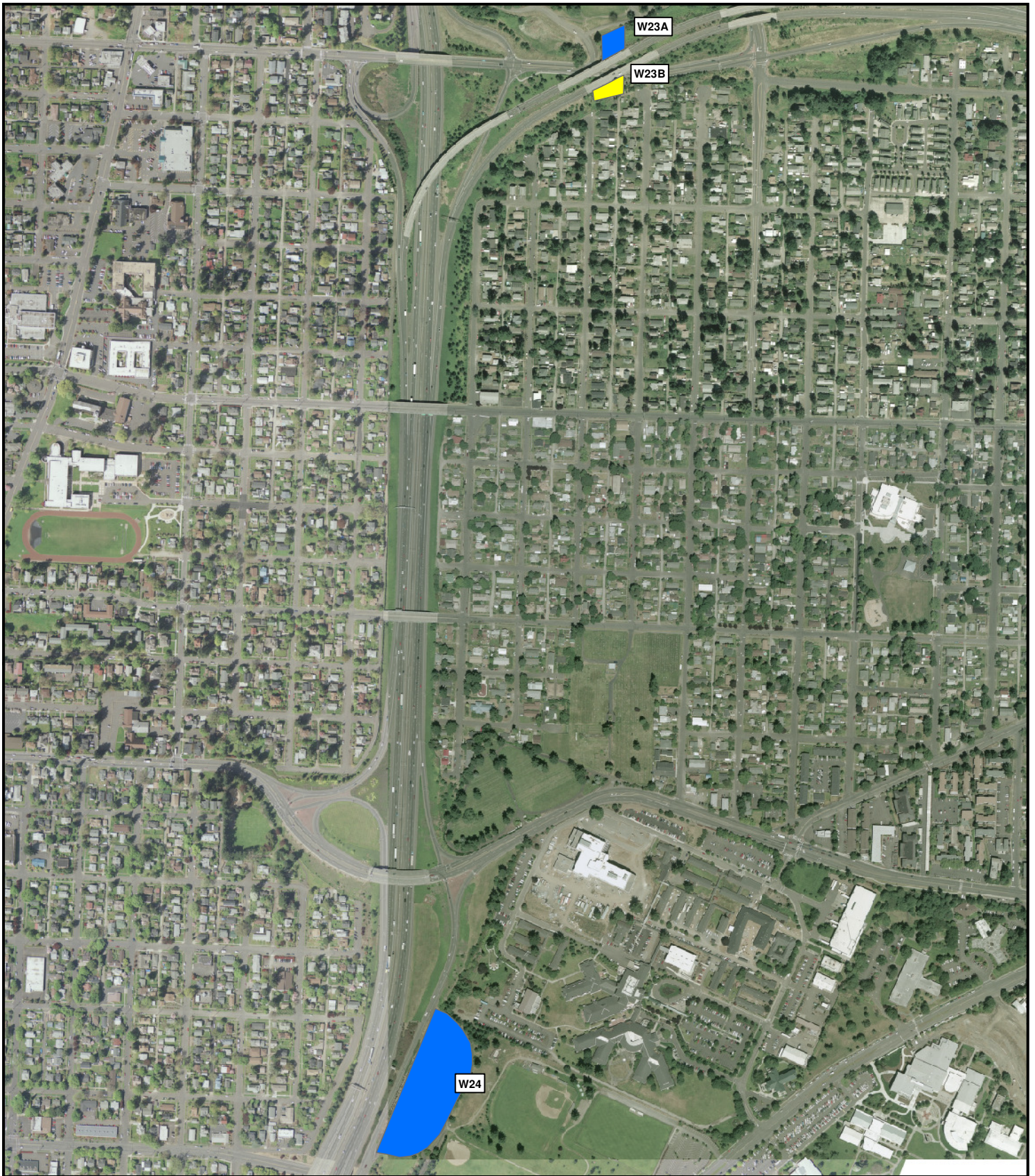


Exhibit 3-12. Significant Archaeological Resource Identified in the Northern Portion of the CRC APE on the Washington Shore



	<ul style="list-style-type: none"> Area Found Not Significant Significant WSDOT Site Area Significant VNHR Site Area 	<ul style="list-style-type: none"> Significant Not Determined Area Not Investigated

3.6.3.2 Assessment Summary for Eligible Archaeological Resources

The I-5 corridor, to a large extent, follows the old alignment of West Reserve Street, the former boundary between the Military Reservation and the City of Vancouver. Significant historical archaeological resources in the CRC APE occur in both the military and civilian zones. The oldest historical archaeological resources in the CRC APE are on the east side of I-5, within the VNHR, and are associated with Kanaka Village at HBC Fort Vancouver. Cultural features were documented and artifacts recovered that were associated with three separate houses in this village—Kanaka House, Tayenta’s House, and House 4. Artifacts were also recovered that may be associated with the former landscape feature known as the Pond. Previous investigations in connection with a reconfiguration of SR 14 in the 1970s, recovered an outstanding sample of HBC and U.S. Army artifacts preserved in the Pond’s deposits (Chance and Chance 1976).

Later historical archaeological remains in the CRC APE on the east side of I-5 relate to activity and occupation on the Military Reservation by the U.S. Army Quartermaster’s Department and other U.S. Army activity at Vancouver Barracks. The locations of six former structures shown on historical maps, and now within the VNHR, fall within the CRC APE. NPS archaeologists have identified all six of these structures as significant archaeological resources. Also within the CRC APE in the VNHR are two landscape features identified as significant archaeological resources, the 1850 McLoughlin Road and the 1880s McLoughlin Road Tree Allée.

Among the eligible archaeological resources within the CRC APE in the Historic City of Vancouver are sites on blocks where the earliest settlement and development in the city occurred. On the east side of I-5, structural remains were exposed that were associated with a warehouse in site 45CL910 and the Vancouver Hotel in VNHR Area #1. On the west side of I-5, extensive brick foundations/walls were exposed in site 45CL921 that correspond with buildings that formerly stood on the west side of the 300 and 400 blocks of Main Street. A brick foundation exposed at the southwest corner of Fourth and Main may be from the first brick building in Vancouver, erected in 1866 (McLellan 1935:88).

Aside from foundations, the most common features encountered during discovery investigations in the historic city were historic pits of various kinds that are generally referred to together as “shaft features.” The most common shaft features found in urban environments are privy pits from outhouses, wells, cisterns, and cellars. Shaft features often served a secondary function as receptacles for disposal of refuse from adjacent homes and businesses. In these situations, recovery and analysis of this material can reveal aspects of daily life in great detail.

Although refuse-disposal pits were among the most common features documented, more substantial brick- or stone-lined shaft features were not encountered during the discovery investigations in the historic city. This situation is almost certainly due to the nature of the discovery investigations, which were limited to sampling of the parcels by excavation of trenches and test units. Shaft features including privy pits, wells, and cellars have been found during previous investigations on nearby city blocks, and similar features almost certainly are present beneath the fill in the other sites in the historic city.

Exhibit 3-13. Summary of Significance Evaluation

CRC Area	Site Number	Eligible/ Contributing	Significance Criteria ^a	Investigator	Report Section
Oregon Shore					
No archaeological resources documented				HERITAGE	Appendix 1B
Washington Shore					
WSDOT Parcels					
W1	45CL910	Yes	d	HERITAGE	Appendix 1C
W4	45CL911 ^b	No	–	HERITAGE	Appendix 1C
W5A	45CL912 ^b	No	d	HERITAGE	Appendix 1C
W5B	45CL913 ^b	No	–	HERITAGE	Appendix 1C
W8A	45CL914 ^b	Yes	d	HERITAGE	Appendix 1C
W8B	45CL915 ^b	Undetermined	–	HERITAGE	Appendix 1C
W9A	45CL916	No	–	HERITAGE	Appendix 1C
W9B	45CL917 ^b	Yes	d	HERITAGE	Appendix 1C
W17	45CL918	No	d	HERITAGE	Appendix 1C
W18A	45CL919	No	–	HERITAGE	Appendix 1C
W18B	45CL920	Yes	d	HERITAGE	Appendix 1C
W19A	45CL921	Yes	d	HERITAGE	Appendix 1C
W19B	45CL922	Yes	d	HERITAGE	Appendix 1C
W19C	45CL923	No	–	HERITAGE	Appendix 1C
W20	45CL924	Yes	d	HERITAGE	Appendix 1C
W23A	45CL925	No	–	HERITAGE	Appendix 1C
W23B	45CL926	Yes	d	HERITAGE	Appendix 1C
W24	no site	No	–	HERITAGE	Appendix 1C
VNHR Areas^c					
VNHR #1	45CL160H	Yes	a,b,d	NPS	Appendix 1D
VNHR #2	45CL162H	Yes	d	NPS	Appendix 1D
VNHR #3	45CL300	Yes	a,b,c,d	NPS	Appendix 1D
VNHR #4	45CL300	Yes	a,c,d	NPS	Appendix 1D
VNHR #5 (north)		No	–	NPS	Appendix 1D
VNHR 5 (south)	45CL164H	Yes	a,d	NPS	Appendix 1D

a Criteria a through d of the NRHP.

b Site in WSDOT parcel that overlaps with administrative boundary of 45CL300 in VNHR.

c Correlation of VNHR Areas with previously recorded archaeological sites suggested by the National Park Service (O'Rourke et al. 2010:286-287).

At first glance, the I-5 corridor along the CRC APE appears an unlikely setting in which archaeological remains might be found. Construction of this section of I-5 and associated interchanges required earth-moving on a massive scale. Much of this earth-moving involved the cutting and removal of native soils in which archaeological evidence of occupation and activity in the prehistoric and historic past may once have been present, but in some areas fill covered and protected archaeological features. The results of the discovery and significance evaluation investigations for the CRC project underscore, once again, the potential preservation of significant archaeological remains beneath the ground surface, even in construction zones where massive earth-moving has occurred.

4. Assessment of Adverse Effect and Resolution to Adverse Effect

Section 106 regulations (35 CFR 800.4(b)(2) and 35 CFR 800.5(a)(3)) allow a “phased” process that provides flexibility in addressing how outstanding efforts to identify, assess, and resolve adverse effects would be implemented to protect historic properties consistent with the requirements of the NHPA. This phased process can be carried out by executing a MOA that will include appropriate stipulations regarding archaeological discovery methods and clear instructions on how and when archaeological field investigations will be conducted. The MOA will afford sufficient protection of the archaeological resources while allowing the project to move forward in steps that would provide opportunities to consider avoidance, minimization, and mitigation options.

In several parts of the APE, access to conduct archaeological investigations necessary to discover buried historic properties is restricted by denial of right-of-entry, as well as the actively and intensively used urban landscapes, such as roadways, sidewalks, and parking lots, in addition to areas beneath actively used roadways, and other areas which present safety and access challenges. Additionally, some areas are out of reach of typical field techniques, so that conducting archaeological subsurface excavations in these areas is practically and logistically highly problematic. As specific project impacts are finalized, these areas will be investigated in a phased manner prior to or during construction, following protocols established in a Treatment Plan.

4.1 Effects

To date, archaeological discovery and site evaluation investigations in connection with the CRC project have been conducted in all areas in which CRC has been granted right-of-entry, including properties owned by ODOT, WSDOT, NPS, the U.S. Army, and the City of Vancouver. No archaeological sites have been identified in the CRC APE on the Oregon shore. To reach the Pleistocene gravels that underlie the project area, to reach the Pleistocene gravels that underlie the project area, archaeological discovery investigations employed rotary-sonic coring to drill through the deep alluvial sediments to depths of 30 m or more. Although no artifacts were recovered, analysis of the sediments from the boreholes suggests archaeological resources may be preserved in the deep flood plain soils on the Oregon shore.

Archaeological discovery and site evaluation investigations have identified significant archaeological sites in the CRC APE on the Washington shore that meet criterion d for eligibility to the National Register. These include seven eligible archaeological sites on WSDOT parcels around the I-5/SR 14 interchange, and one eligible archaeological site around the I-5/SR 500 interchange. Localities that may contribute to the significance of the VNHR District under criterion d have also been identified by NPS archaeologists in all five areas in the VNHR investigated in connection with the CRC project.

Construction excavations during the CRC project could directly affect the significant archaeological resources so far identified. Considering the extensive earth-moving construction activities that will be needed to construct the CRC project, it is likely that these activities would severely alter or destroy the integrity of that portion of each identified archaeological resource that lies within the direct impact areas. As well, additional significant archaeological sites may be

identified and damaged by construction in areas not yet subjected to archaeological discovery investigations.

The design of the CRC project has not been finalized, and all areas in which construction impacts may occur have not been identified. Although avoidance alternatives may be considered, the identified sites in the APE in Washington will likely be affected by a wide range of construction and staging activities, and given the project description this effect would be “adverse.”

At this point, it is assumed that any archaeological sites in the existing ODOT and WSDOT rights-of-way within the CRC APE will be subject to adverse effects until demonstrated otherwise. Any impacts from the CRC project outside the ODOT and WSDOT rights-of-way still need to be assessed.

Potential adverse effects will be resolved in a Section 106 MOA developed among WSDOT, ODOT, FHA, FHWA, DAHP, SHPO, and affected tribes. The MOA will identify responsible parties for complying with elements of the agreement, outline mitigation measures and archaeological treatment and monitoring plans that would be applied, and will bind signatories to comply with the mitigation measures.

4.2 Work Remaining and to be Incorporated into MOA

The substantial efforts undertaken to date to identify eligible archaeological resources in the CRC APE have been described in this report and related appendices. Additional work to be conducted includes pre-construction investigations in areas not already examined, phased construction fill removal and archaeological testing of native soils in areas currently inaccessible due to deep fill, and monitoring by an archaeologist during construction.

In particular, archaeological monitoring of earth-moving during construction is expected to play a major role due to the current inaccessibility of substantial portions of the APE (e.g., the existing I-5 infrastructure), and in view of the high potential for encountering significant prehistoric and historical archaeological remains in the APE. The MOA will include stipulations to ensure that appropriate measures are taken with respect to the NHPA and other applicable cultural resource protection laws and regulations.

4.2.1 Determination of Significance at W8B and W13

The archaeological significance of two WSDOT parcels has not been determined. Further archaeological investigations will need to be conducted at some time in the future if construction during the CRC project will result in impacts to these parcels.

W8B on the northeast side of the I-5/SR 14 interchange is covered by deep fill deposits that support travel ramps providing access to and from SR 14 to I-5 and the City of Vancouver. W8B is situated on the western periphery of the U.S. Army’s Quartermaster’s Depot at Vancouver Barracks (Exhibit 3-11). Archaeological remains were identified in the W8B vicinity during investigations in connection with earlier reconfigurations of the I-5/SR 14 interchange. Historical artifacts recovered from fill deposits in a backhoe trench were recorded as site 45CL915. A backhoe could not reach deep enough to determine if any intact artifact-bearing deposits or cultural features are present beneath the fill deposits covering W8B.

W13 is a narrow strip of ground on the east side of I-5 beginning on the north side of Evergreen Boulevard (Exhibit 3-11). Historically, W13 falls within the former area of the Old Post Cemetery at Vancouver Barracks, in use from the 1850s to 1883. In 1883 the burials at this

cemetery were relocated to a new military cemetery on Fourth Plain Boulevard. However, the uncovering of human skeletal remains during construction of I-5 in 1953 (Thomas and Freidenburg 1998:6), as well as the recent discovery by NPS archaeologists of a human metatarsal at VNHR Area #1 immediately to the east, raises the possibility that additional human remains missed during the burial relocation may be present at W13. Discovery investigations at W13 are on hold pending the outcome of ongoing consultations regarding the appropriate investigative approach.

4.2.2 Transit Alignments in Vancouver, Washington

Identifying archaeological resources along the proposed transit alignments in Vancouver is highly problematic due to their occurrence below existing city streets. In addition to asphalt or concrete pavement covering the street surfaces, the underlying sediments are intensively layered by utilities. Conducting archaeological testing in the streets would be disruptive to pedestrians, automobile traffic, residences, and businesses.

Construction of the transit system will entail substantial excavations within existing streets. In addition to installation of the rails themselves, excavations will be required for rail utility vaults, replacement of street cross-sections including sidewalks, and underground utility relocations. Combined, these actions constitute an undertaking of substantial magnitude that warrants serious consideration and disclosure of the potential to affect archaeological resources.

Scattered evidence of prehistoric Native American activity has been found, but the primary concern in the Vancouver area is with historical archaeological resources. A wide range of historical archaeological features, some many feet below fill material, has been encountered during previous investigations in the Historic City of Vancouver. These features include artifact sheet scatters and midden-like trash deposits, several types of shaft and pit features (e.g., privy vaults, trash pits, wells, cisterns, cesspools), and structural remains from commercial, residential, and industrial buildings.

The majority of the proposed transit alignment could be considered to have a high probability of containing archaeological resources, as it passes through parts of Vancouver that were developed between the mid-1800s to early 1900s. However, within the existing roadways, the most likely archaeological resources will be sheet scatters of artifacts that were disposed of in front yards or roads prior to garbage disposal regulations, and abandoned or filled cisterns at intersections. Although the rails from the historic railway systems reportedly were removed (Freece 1985), rails have been observed within Columbia Street between West 3rd and West 6th Streets (Robbins 1996), and additional evidence of the historic street railway system may be encountered during construction. Due to the nature of the work, and the nature of the potential archaeological resources to be encountered, archaeological monitoring is recommended along the transit alignment. Identified archaeological resources will be evaluated according to protocols established in the treatment plan.

Development of the transit system includes construction of the proposed Mill District Park and Ride, an entire block currently used as a parking lot. This block was occupied by the Hidden Brother's brick factory/kiln/drying racks and lumber yard. The Hidden Brothers were prominent Vancouver citizens. Brick from their business was used extensively in town development. Investigations on this block have the potential to recover new information about a business that played a major role in the development of Vancouver and the surrounding area. Archaeological investigations of this block should be conducted prior to construction.

4.2.3 Casting and Staging Areas

Construction activities for the CRC project will require at least one large site to stage equipment and materials (Exhibit 1-4). Three locations have been identified as possible major staging areas for the CRC project. Background research was conducted in order to assess the possibility of each potential staging area to contain significant archaeological resources.

- The Port of Vancouver location is a 52-acre tract along SR 501 and near the Port of Vancouver's Terminal 3 North facility. Portions of this tract are buried by substantial fill material, and in other portions the ground surface has been disturbed by past construction and use. The tract contains no recorded archaeological sites, but it is located within the Vancouver Lakes Archaeological District, determined to be NRHP-eligible in 1982. In view of its location in proximity to the archaeological district and to the Columbia River, the likelihood of encountering deeply buried archaeological resources in this parcel is high.
- The Red Lion at the Quay Hotel location is a 2.6-acre tract immediately west of I-5 in Vancouver. This tract is covered by fill material. The tract contains no recorded archaeological sites, and it lies outside the Vancouver Lakes Archaeological District. However, in view of its location in the Historic City of Vancouver and on the Columbia River shoreline, the likelihood of encountering deeply buried archaeological resources in this parcel is high.
- The Old Thunderbird Hotel location is a 5.6-acre tract immediately west of I-5 on Hayden Island in Portland. This tract is covered by fill material. The tract contains no recorded archaeological sites. However, in view of its location on the Columbia River shoreline, the likelihood of encountering deeply buried archaeological resources in this parcel is high.

A casting yard could be required for construction of the over-water bridges if a precast concrete segmental bridge design is used. Two locations have been identified as possible casting yards for the CRC project. Background research was conducted in order to assess the potential of each potential casting yard to contain significant archaeological resources.

- The Alcoa/Evergreen location is a 95-acre tract along SR 501 and near the Port of Vancouver's Terminal 3 North facility. This tract contains no recorded archaeological sites, but it is located within the Vancouver Lakes Archaeological District. In view of its location in the archaeological district and its proximity to the Columbia River shoreline, the likelihood of encountering deeply buried archaeological resources in this tract is high.
- The Sundial location is a 50-acre tract situated on the Columbia River shoreline between Fairview and Troutdale, just north of the Troutdale Airport. This tract contains no recorded archaeological sites. However, it is located near the confluence of the Sandy and Columbia Rivers, an area considered to have a high probability of containing prehistoric archaeological resources. In view of its setting, the likelihood of encountering buried archaeological resources in this tract is high.

Each of these potential casting and staging areas has a high potential to contain archaeological resources, but the areas are mostly covered by deep fill material. Staging and casting areas will primarily be used for construction offices, to stage the larger equipment such as cranes, and to store materials such as rebar and aggregate, activities that are unlikely to have deep subsurface impacts. The MOA will include stipulations to ensure that the selected parcels are investigated with respect to the NHPA and other applicable cultural resource protection laws and regulations.

4.2.4 Submerged Shelf on Washington Shore

There is a high potential for underwater archaeological resources in the Columbia River along the Washington shore. Previous underwater explorations identified a relatively flat shelf, about 300 feet in length and about 50 to 60 feet in width, paralleling the river bank along the Washington shore. Underwater surveys conducted along the submerged shelf upstream from the existing I-5 bridges noted the presence of stone artifacts as well as artifacts of Euroamerican manufacture, and recorded two archaeological sites (Stenger 1988a, 1988b; Marcotte and Wilson 2007).

As currently designed, two bridge piers will be located on this shelf, just west of the existing I-5 bridges. One pier will be located in the footprint of an existing quay belonging to the Red Lion at the Quay, and the other will be located between the quay and the existing I-5 bridges. After discussions with the Department of Natural Resources, which manages submerged lands for the state, CRC will conduct an archaeological survey once the footprints of the bridge piers are finalized, the U.S. Army conducts a survey for unexploded ordnance, right-of-entry to the property is gained, and during an available in-water work window to avoid harm to fish.

4.2.5 Oregon Shore

The rotary-sonic borings undertaken for geoarchaeological purposes have produced a substantial amount of information about the evolution of the environment in the CRC APE on the Oregon shore over the last 12,000 years. This information suggests the reasonable likelihood that archaeological remains may be encountered in the thick alluvium during construction of the CRC project. The most likely locations for finding archaeological remains are on natural levees along the banks of Oregon Slough.

The thickness of the artificial fill that overlies the alluvium precludes conventional archaeological discovery investigations. Due to the considerable thickness of the alluvium, any archaeological materials found are likely to be recovered during the drilling of boreholes and any other deep excavations undertaken during construction. Accordingly, any additional boreholes drilled, as well as any construction excavations that penetrate below the artificial fill, should be monitored by an archaeologist to ensure that any archaeological materials encountered are identified. In the event that archaeological remains are encountered during drilling and/or construction, archaeological testing and/or data recovery investigations will be taken (to the extent such work is feasible given the depth below surface of the findings) in compliance with federal and state cultural resource laws and regulations.

4.2.6 Submittal of Final Report

The present document presents interim final report on archaeological discovery and significance evaluation efforts undertaken for the CRC project. Geoarchaeological investigations by HERITAGE on the Oregon shore involved processing and interpretation of samples of sediments, tephra, and wood/charcoal for radiocarbon dating from 14 rotary-sonic boreholes. Archaeological investigations were conducted by HERITAGE on 18 separate parcels in Washington, resulting in the documentation of 64 cultural features and the recovery of 14,643 artifacts from 17 archaeological sites. Likewise, NPS documented 36 cultural features and recovered 34,014 artifacts from five areas in the CRC APE along the periphery of the VNHR.

Analysis and integration of the accumulated results of archaeological investigations of this magnitude required a substantial effort to identify, catalogue, analyze, interpret, and synthesize the accumulated geoarchaeological and archaeological data. Completion of the series of reports synthesizing the results of the investigations conducted reflects a substantial commitment by CRC

to ensure that the maximum amount of information is gained from the public's investment in the archaeological research undertaken for this project.

5. Permits and Approvals

Several federal, state, and local environmental laws and regulations addressing historic resources may require permits and approvals.

5.1 Federal

National Historic Preservation Act (NHPA) of 1966 (P.L. 102-575; 16 USC 470), as amended. 36 CFR 800. 40 CFR 1508.27. Executive Order 11593. This act is the primary authority used in complying with the nation's cultural resources protection objectives. It is implemented through federal regulations (36 CFR 64, 36 CFR 800, 40 CFR 1508.27).

- As required by Section 106 of the National Historic Preservation Act (1966) the SHPO and DAHP must be consulted and have the opportunity to comment on the APE, determinations of eligibility for the National Register of Historic Places, level of effect, and all MOA. As described in 36 CFR 800.1 to 800.7 also known as the Section 106 Process.
- FHWA and FTA must agree and approve all Section 106 findings and mitigation plans and Section 4(f) Evaluations required by the Federal Highway Act (1966).

5.2 State

Section 106 of the National Historic Preservation Act requires SHPO consultation and agreement and supersedes state laws.

5.3 Local

The City of Portland, City of Vancouver, Multnomah County, and Clark County planning departments and local historic resources commissions are considered interested parties and should be informed about the effects on historic properties and resources in their jurisdictions.

Alteration or demolition of any structure listed on the Clark County Heritage Register will require a Certificate of Appropriateness (C of A) from the Clark County Historic Preservation Commission. No alterations or demolitions to listed structures have been identified.

The northbound I-5 bridge is listed on the National Register of Historic Places. National Register-listed properties are subject to a demolition review process by the Portland Landmarks Commission. The Bureau of Development Services (BDS) is responsible for conducting this as a type of land use review. The Landmarks Commission recommendation is advisory to City Council. See Zoning Code section 33.445.810 for additional details.

This page intentionally left blank.

6. References

- Ames, Kenneth M., Don E. Dumond, Jerry R. Galm, and Rick Minor. 1998. Prehistory of the Southern Plateau. In *Plateau*, edited by Deward E. Walker, pp. 103-119. *Handbook of North American Indians*, Vol. 12, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- Anonymous. n.d. Archaeological Site Record Form for Kanaka Village, 45CL300. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Bacon, Charles R., and Marvin A. Lanphere. 2006. Eruptive History and Geochronology of Mount Mazama and the Crater Lake Region, Oregon. *Geological Society of America Bulletin* 118(11-12):1331-1359.
- Beeson, M., and T. Tolan. 1993. Overview of the Stratigraphy and Structure of the Portland Area. Field Trip for Association of Engineering Geologists, Portland.
- Beeson, M. H., T. Tolan, and I. P. Madin. 1991. Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington. DOGAMI Geologic Map Series GMS-75. Portland.
- Benito, Gerardo, and Jim E. O'Connor. 2003. Number and Size of Last-Glacial Missoula Floods in the Columbia River Valley Between the Pasco Basin, Washington, and Portland, Oregon. *Geological Society of America Bulletin* 115(5):624-638.
- Boyd, Robert. 2010. Ethnohistorical Accounts of Indian Settlements and Land Use in the Vicinity of the Interstate 5 Bridge Over the Columbia River. Appendix II in Appendix 1B: Archaeological Discovery and Evaluation: ODOT Parcels, by Rick Minor, Curt D. Peterson, and Kendra Carlisle. Heritage Research Associates, Inc. Report to Columbia River Crossing Project, Vancouver.
- Bristow, C. S., and H. M. Jol. 2003. Ground Penetrating Radar in Sediments. *Geological Society Special Publication No. 211*. London.
- Carley, Caroline. 1982. Kanaka Village/Vancouver Barracks 1977. Office of Public Archaeology, University of Washington, Reports in Highway Archaeology No. 8. Seattle.
- Caywood, Louis. 1955. Final Report: Fort Vancouver Excavations. On file, Fort Vancouver National Historic Site, Vancouver.
- Chance, David H., C. Carley, K. Gurcke, T. Jones, G. Ling, M. Pfeiffer, K. Roenke, J. Storm, R. Thomas, and C. Troup. 1982. Kanaka Village/Vancouver Barracks 1975. Office of Public Archaeology, Reports in Highway Archaeology 7, University of Washington, Seattle.
- Chance, David H., and Jennifer V. Chance. 1976. Kanaka Village/Vancouver Barracks 1974. Office of Public Archaeology, University of Washington, Reports in Highway Archaeology No. 3. Seattle.

- Engum, Jennifer K. 2009. Traditional Cultural Use Investigation for the Columbia River Crossing Project, Clark County, Washington. Report by the Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon.
- Foit, Franklin F., Jr. 2010. Letter of February 11 to Rick Minor reporting results of microbeam analysis of tephra samples from CRC Project. On file, Heritage Research Associates, Inc., Eugene.
- Freece, David W. 1985. A History of the Street Railway Systems of Vancouver, Washington, 1889-1926. Unpublished M.A. thesis in History, Portland State University, Portland.
- Goethals, Geo. W. 1883. A Map of the Country in the Vicinity of Vancouver Barracks, Washington Territory. Clark County History Volume XII, 1971. Fort Vancouver Historical Society, Vancouver, Washington.
- HARD Townsites Team. 2007. Townsites: Historic Context and Archaeological Research Design. Prepared for California Department of Transportation, Sacramento. Electronic document, http://www.sonoma.edu/asc/publications/HARD/Townsite%20Research%20Design_Draft2_Web.pdf, accessed 2010.
- Hussey, John A. 1957. The History of Fort Vancouver and Its Physical Structure. Washington State Historical Society.
- Kardas, Susan. 1971. "The People Bought This and The Clatsop Became Rich." A View of Nineteenth Century Fur Trade Relationships on the Lower Columbia Between Chinookan Speakers, Whites, and Kanakas. Unpublished Ph.D. dissertation in Anthropology, Bryn Mawr, Pennsylvania.
- Kuper, H. Tom, and John. L. Lawes. 1994. Geology and Geomorphology. In An Inventory and Assessment of Archaeological Resources in the Columbia South Shore for the City of Portland, Oregon, by Rick Minor, Robert R. Musil, and Kathryn Anne Toepel, pp. 7-13. Heritage Research Associates Report No. 165. Eugene.
- Lentz, R. T. 1983. The Petrology and Stratigraphy of the Portland Hills Silt: A Pacific Northwest Loess. *Oregon Geology* 43:3-10.
- Little, Barbara, Erika Martin Seibert, Jan Townsend, John H. Sprinkle, Jr., and John Knoerl. 2000. Guidelines for Evaluating and Registering Archaeological Properties. National Register Bulletin 36 (revised), Washington, D.C. Electronic document, <http://www.nps.gov/history/nr/publications/bulletins/arch/pt4.htm>, accessed 2010.
- Marcotte, Jacqueline, and Douglas C. Wilson. 2007. Archaeological Survey of the Hudson's Bay' Company Waterfront, Fort Vancouver National Historic Site. On file, Fort Vancouver National Historic Site, Vancouver.
- McLellan, Sister Mary De Sales. 1935. Vancouver, Washington, 1846 to 1870. Unpublished M.A. thesis, University of Oregon, Eugene.
- Minor, Rick and Curt Peterson. 2008. Archaeological Work Plan for Ground-Penetrating Radar (GPR) Exploration, Columbia River Crossing Project. Heritage Research Associates, Inc. Report to Columbia River Crossing Project, Vancouver.

- Minor, Rick, Curt Peterson, and Mike Gallagher. 2009. Proposed Work Plan for Geoarchaeological Discovery Probing on the Oregon Shore for the CRC Project. Heritage Research Associates, Inc. Report to Columbia River Crossing Project, Vancouver.
- Minor, Rick, Kathryn Anne Toepel, and Stephen Dow Beckham. 2007. Interstate 5 Columbia River Crossing – Archaeology Technical Report. Heritage Research Associates, Inc. Report to Columbia River Crossing Project, Vancouver.
- Mullineaux, Donald R. 1996. Pre-1980 Tephra-Fall Deposits Erupted From Mount St. Helens, Washington. U.S. Geological Survey Professional Paper 1563.
- Northwest Cultural Resources Institute. 2009. Amendments to the Archaeological Research Design and Work Plan for Archaeological Testing, Columbia River Crossing Project, Vancouver National Historic Reserve, Washington. Submitted to Columbia River Crossing Project, Vancouver.
- Owens, Erica, Doug Wilson, Bob Cromwell, Janene Caywood. 2007. National Register of Historic Places Registration Form for Vancouver National Historic Reserve Historic District. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Peterson, Curt D. 2007. Appendix A: Geology and Geomorphology. In Interstate 5 Columbia River Crossing – Archaeology Technical Report, by Rick Minor and Kathryn Anne Toepel. Heritage Research Associates, Inc. Report to Columbia River Crossing Project, Vancouver.
- Pettigrew, Richard M. 1981. A Prehistoric Culture Sequence in the Portland Basin of the Lower Columbia Valley. University of Oregon Anthropological Papers No. 22. Eugene.
- Punke, Michele, Judith Chapman, and Jo Reese 2010. Archaeological Survey for the Portland-Milwaukee Light Rail Project, Multnomah and Clackamas Counties, Oregon. Archaeological Investigations Northwest Report No. 2451. Portland.
- Robbins, Jeff. 1996. Vancouver Rail Tracks. Washington Archaeological Site Inventory Form for 45CL444. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Smith, M. A. 1980. Determination of Eligibility Form for Fort Vancouver - Kanaka Village, 45CL300. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Stenger, Alison. 1988a. Marine Archaeological Surveys Site Record Form for 45CL400. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Stenger, Alison. 1988b. Marine Archaeological Surveys Site Record Form for 45CL401. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Thomas, Bryn. 1992. An Archaeological Overview of Fort Vancouver, Vancouver Barracks, House of Providence, and the World War II Shipyard, Clark County, Washington. Report by Archaeological and Historic Services, Eastern Washington University, to the National Park Service, Pacific Northwest Region.

- Thomas, Bryn, and Linda Freidenburg. 1998. A Review of Data Pertaining to Cemeteries, Human Remains, Burials, and Grave Markers Associated with Fort Vancouver and Vancouver Barracks, Clark County, Washington. Archaeological and Historical Services, Eastern Washington University, Short Report 543.
- Thomas, Bryn, and Charles Hibbs, Jr. 1984. Report of Investigations at Kanaka Village/Vancouver Barracks, Washington, 1980-1981. Report by Archaeological and Historic Services, Eastern Washington University, to the Washington State Department of Transportation, Olympia.
- Townsend, Jan, John H. Sprinkle, Jr., and John Knoerl. 1993. Guidelines for Evaluating and Registering Historical Archaeological Sites and Districts. National Register Bulletin 36, Washington, D.C.
- Trimble, D. E. 1963. Geology of Portland, Oregon, and Adjacent Areas. U.S. Geological Survey Bulletin No. 1119. Portland.
- Whipple, Brigitte M. 2009. Oral History Study of Columbia River Crossing Project. Report by the Confederated Tribes of the Warm Springs Reservation of Oregon submitted to the Columbia River Crossing Project, Vancouver.
- Williams, Scott. 2009. Archaeological Research Design for the Washington Portion of the Columbia River Crossing (CRC) Project, Clark County, Washington. Submitted to the Washington Department of Archaeology and Historic Preservation, Olympia.
- Wilson, Douglas C. 2005. The Confluence Project Land Bridge at the Vancouver National Historic Reserve, Vancouver, Washington: Archaeological Survey, Test Excavations and Treatment Plan. Report by National Park Service. On file, Washington Department of Archaeology and Historic Preservation, Olympia.
- Zdanowics, C. M., G. A. Zielinski, and M. S. Germani. 1999. Mount Mazama Eruption: Calendrical Age Verified and Atmospheric Impact Assessed. *Geology* 27(7):621-624.