Probes 23 through 26 (Thomas 1994:8). By today's standards, such small, widely spaced probes would be considered only minimally sufficient for testing. Probe 1A and Probe 2 are within VNHR Area #4; and Probes 4 through 32 (even numbers only, plus Probe 23 and Probe 25) are within or adjacent to VNHR Area #3 in the current CRC APE.

The average depth of fill material in the probes, usually imported bark dust, sand, and gravel, was 21 in. below the present surface. The fill was placed directly on top of native sediments. The artifacts recovered in each shovel probe were not detailed, but 20th-century material, largely coal and roofing slate, comprised the majority (63%) of the total artifacts. Probe 2, located at the site of the concrete coal storage pad, contained 83% of the coal recovered from all 19 probes. Nineteenth-century artifacts, largely brick and bottle glass fragments, comprised 30% of the total artifacts found. No discrete concentrations of HBC-era artifacts were observed. The heaviest concentration of brick fragments was found in Probes 23 through 26, the probable location of a 19th-century Quartermaster's Stable (Thomas 1994:8-9). A single 5 x 5 ft. excavation unit was opened to obtain an expanded view of a brick foundation found in Probe 25. Feature 1, a brick pier found at a depth of 1.7-2.8 ft., showed the same mortar type found in the 1871-1881 brick piers reported in the Quartermaster's Stable foundation (Operation 60) by Thomas and Hibbs (1984:635-694). An irrigation trench with PVC pipe was found to the east of the brick pier. Thomas recommended that the proposed pedestrian undercrossing restrict ground disturbance to a depth of 0.5 ft. in the stable area, with no adverse effect to archaeological resources anticipated south of the stable (Thomas 1994:12).

Field School 2001-2003

From 2001 through 2003, 50 x 50 cm STs and 1 x 1 m TUs were excavated throughout the untested portions of the Village during the Portland State University/Washington State University Vancouver, Fort Vancouver Public Archaeology Field School. The 2001 STs were located east of VNHR Area #3, around the Village gate, and between the Village gate and the SR 14 right-of-way.

Twenty-five of the 2003 STs were excavated on the west side of the Village north and west of the CCC-era gravel driveway near VNHR Area #3 (Figure 59). A review of the artifacts recovered show the level of disturbance in this area of the Village. Artifacts that were judged to be indicative of disturbance and post-1900 deposition were plastic, aluminum foil, styrofoam, paper, wire nails, composition roofing tile, concrete, and asphalt. Shovel tests 68, 71, 72, 73, 85, 86, 87, 88, and 92 had largely intact sediments, showing disturbance or post-1900 artifacts to a depth of only 10-20 cm. Shovel tests 67, 69, 70, 74, 79, 80, 89, 90, and 91 showed disturbed sediments or post-1900 artifacts to a depth of 30-40 cm. Shovel tests 76 and 78 were disturbed to a depth of 60-70 cm. Shovel tests 64, 65, 66, 75, and 77 were disturbed for their entire depth, from 40 to 90 cm.

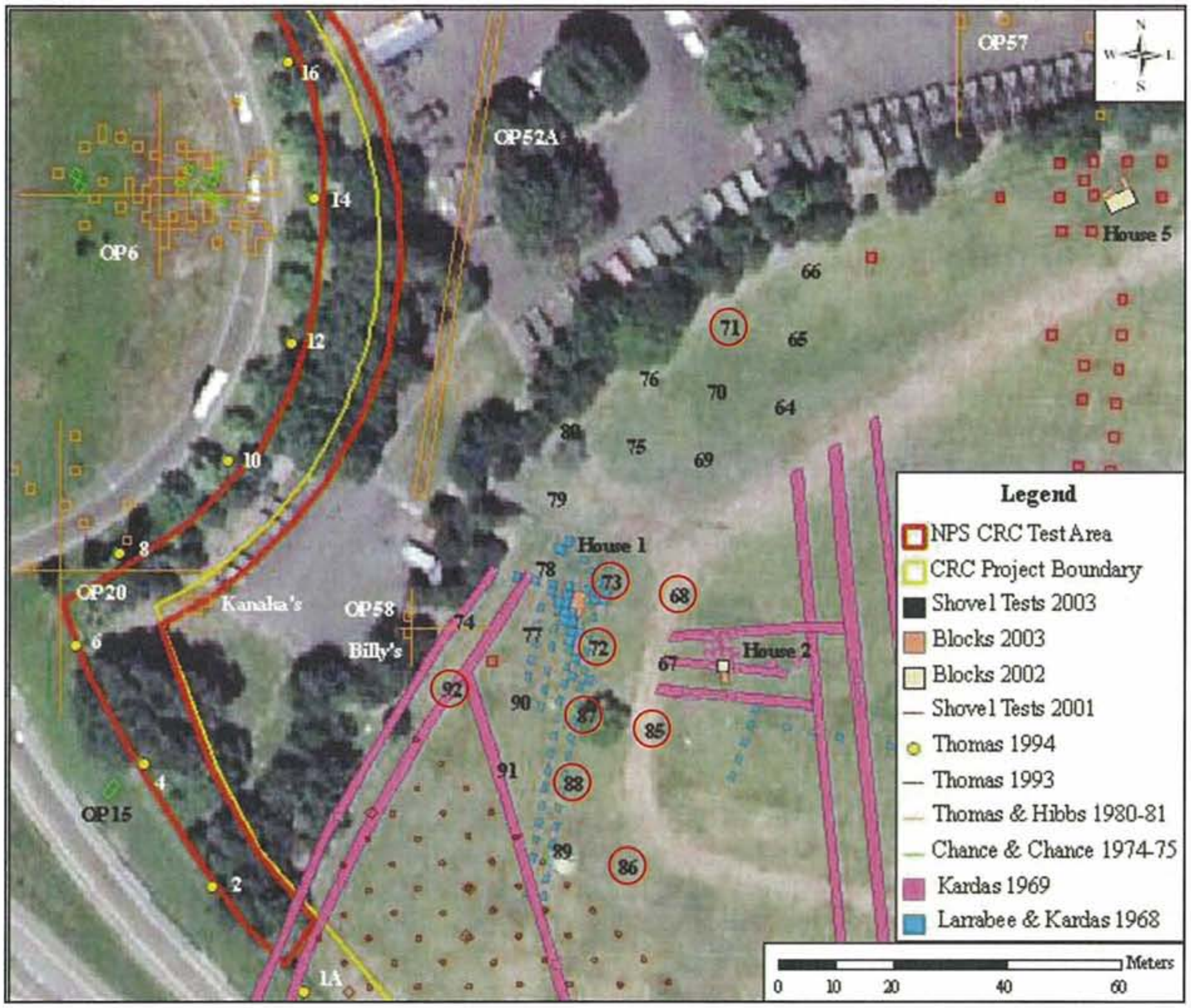

FIGURE 59. STs from the 2003 Fort Vancouver Public Archaeology Field School, with relatively undisturbed units circled in red. (NPS 2010)

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METHODS

The National Park Service conducted archival research, remote sensing surveys, and archaeological test excavations within the CRC APE in VNHR Area #3 on U.S. Army property from East 5th Street to SR 14 to identify archaeological resources that may be adversely affected by the CRC project.

Geophysical Surveys

Steve De Vore of the Midwest Archaeological Center of the NPS conducted a GPR survey throughout VNHR Area #3 on February 23-25, 2009. Rectangular survey grids were established within the project area as terrain and vegetation allowed, squaring the curves along the freeway ramps.

Archaeological Test Excavations

The NPS conducted subsurface testing within VNHR Area #3 to target anomalies seen in the GPR surveys, in areas of possible historical buildings and features seen on historical maps and documents, to answer the questions outlined in the Project Goals section, and at regular intervals throughout the project area. Testing extended up to 5 m beyond the anticipated project boundary in portions of this area because of changes made in the APE by CRC. Anticipated findings in this area included archaeological deposits associated with the 1892 U.S. Army Stable building that was located just south of East 5th Street; 1859 Quartermaster's Stable building that was located behind the modern Building 400; and 1850 McLoughlin Road, 1880s McLoughlin Road tree allée, 1906 Railroad Spur, and 1840s Kanaka and Tayentas houses in the western HBC Village area.

Thick layers of fill covered the ground surface throughout VNHR Area #3 within the CRC APE. Mechanical excavation of exploratory trenches with a backhoe was conducted to sample the sediments and to remove fill layers to access buried archaeological deposits and features.

EXCAVATION RESULTS

From May 8 through June 26, 2009, the NPS conducted archaeological testing in VNHR Area #3 on U.S. Army property from East 5th Street on the north to SR 14 on the south. For ease of discussion, VNHR Area #3 is divided into three segments from north to south. The northern area includes a wedge-shaped lawn area just south of East 5th Street behind Building 402, and a narrow landscaped corridor between Building 400 and the Interstate 5 right-of-way chain link fence. The central area is within a gated security area from the south end of Building 400 between the Interstate 5 right-of-way fence and a paved driveway, south to where the driveway ends in a paved parking lot. The southern area is bounded by the south edge of the paved parking lot on the north, the SR 14 westbound to Interstate 5 northbound ramp chain link fence on the south, the NPS Fort Vancouver National Historic Site fence on the east, and the Interstate 5 northbound to City Center loop fence on the west.

Thirty-nine exploratory backhoe trenches totaling 257.4 m in length (252.4 m^2) were excavated within VNHR Area #3 (Table 13), including 16 trenches in the northern portion of VNHR Area #3 (Trench 3-29 through Trench 3-39), 12 trenches in the central portion of VNHR Area #3 (Trench 3-17 through Trench 3-28), and 11 trenches in the southern portion of VNHR Area #3 (Trench 3-01 through Trench 3-16). A backhoe with an 18 in. toothed bucket was used in the northern and central portions of VNHR Area #3 to access cultural strata below deep deposits of cobbly fill and construction debris. A 36 in. smooth bucket was used in the southern portion of VNHR Area #3 to remove deep sandy fill deposits overlying intact cultural strata.

Twenty-two TUs (20.85 m^2) were excavated within or adjacent to backhoe trenches and oriented to an axis of their trench (Table 14). The TUs included 5 TUs in the northern portion of VNHR Area #3 (TU3-18 through TU3-22), one TU in the central portion of VNHR Area #3 (TU3-17), and 16 TUs in the southern portion of VNHR Area #3(TU3-01 through TU3-16). Level 1 of the TUs encompassed the entire extent of the mechanically removed fill. Twenty-three features were recorded in this portion of the project area (Table 15). Features included 9 features in the central portion of VNHR Area #3 (Features 27-35), and 14 features in the southern portion of VNHR Area #3 (Features 16-26 and Features 36-38). Directions given in the text are relative to the orientation of the GPR grid.

U.S. Army Northern Area

The northern portion of West Barracks VNHR Area #3 was located in a landscaped area south of East 5th Street within 15 m (50 ft.) of the Interstate 5 freeway right-of-way fence. The northern wedge bordered East 5th Street on the north and extended south approximately 36 m (118 ft.) on the northwest and southwest sides of Building 402 (Figure 60). The remainder of this portion of Area #3 bordered the freeway fence on the northwest side of the modern Building 400, beginning at the fence corner and extending approximately 60 m (197 ft.) to a chain link fence on the south (Figures 61-63). This area was the location of a 1892 U.S. Army Stable building just south of East 5th Street, and the 1859 Quartermaster's Stable building behind Building 400.

TABLE 13
EXPLORATORY BACKHOE TRENCHES WITHIN VNHR AREA #3

Trench	Dimensions (cm)				Associated Test Units	
	Width	Length	Depth of Fill	Maximum Depth	Unit(s)	Findings*
Southern						
3-01	105	1100	86	180	-	-
3-02	110	450	50	55	TU3-04	-
3-03	120	330	84	100	TU3-01	+
3-04	105	350	104	115	-	-
3-05	110	620	94	110	TU3-03	+
3-06	110	550	94	110	TU3-02	+
3-07	110	600	118	125	TU3-05	+
3-08	115	1270	80	120	TUs 3-06, 3-07, 3-16	+
3-09	120	860	>35	35	-	-
3-10	115	4320	24-67	90	TUs 3-08, 3-09, 3-10, 3-11	+
3-11	105	1870	48-84	100	-	-
3-12	110	910	43	50	TU3-12	+
3-13	120	1170	>50	50	-	-
3-14	115	1110	65	100	TUs 3-13, 3-14, 3-15	+
3-15	55	990	83	85	-	-
3-16	130	515	>55	55	-	+
Central						
3-17	110	285	55	120	-	-
3-18	60	780	71	120	-	-
3-19	55	315	71	107	-	-
3-20	57	315	50	60	-	-
3-21	55	315	76	76	-	-
3-22	60	290	84	90	-	-
3-23	150	1960	71	150	TU3-17	-
3-24	80	420	134	143	-	-
3-25	115	270	127	140	-	-
3-26	105	270	148	159	-	-
3-27	105	300	85	122	-	-
3-28	105	230	159	163	-	-
Northern						
3-29	105	300	>210	210	-	-
3-30	55	225	135	160	-	-
3-31	60	240	95	123	TU3-18	-
3-32	55	185	92	178	TU3-19	+
3-33	85	400	>120	120	TU3-20	+
3-34	60	250	135	190	-	-
3-35	80	340	96	120	TU3-21	-
3-36	65	295	87	125	-	-
3-37	70	305	79	103	-	-
3-38	60	165	74	114	-	-
3-39	60	270	103	120	TU3-22	+

*significant archaeological deposits in intact strata (+ or -)

TABLE 14
ARCHAEOLOGICAL TEST UNITS WITHIN VNHR AREA #3

Test Unit	Backhoe Trench	Maximum Depth (cm)	Findings
Southern			
TU3-01	3-03	125	Tayentas House overlain by early U.S. Army material
TU3-02	3-06	207	Tayentas House beneath railroad debris, Features 16-17
TU3-03	3-05	195	Tayentas House, Feature 18
TU3-04	3-02	107	disturbed
TU3-05	3-07	141	Tayentas House
TU3-06	3-08	122	Tayentas House
TU3-07	3-08	122	Tayentas House
TU3-08	3-10	119	Tayentas House, Feature 38
TU3-09	3-10	54	Kanaka House
TU3-10	3-10	60	McLoughlin Road (Feature 19) with nearby Heritage Tree Allée
TU3-11	3-10	55	disturbed
TU3-12	3-12	84	Kanaka House, Features 21 and 25
TU3-13	3-14	69	Kanaka House, Features 22, 24, 26, and 36
TU3-14	3-14	70	Kanaka House, Features 23, 26, and 36
TU3-15	3-14	73	Kanaka House, Feature 23
TU3-16	3-08	120	Tayentas House
Central			
TU3-17	3-23	141	U.S. Army Building T-137
Northern			
TU3-18	3-31	112	disturbed, Feature 28
TU3-19	3-32	138	Quartermaster's Stable, Features 27, 30, and 32
TU3-20	3-33	148	Quartermaster's Stable, Features 29 and 31
TU3-21	3-35	121	disturbed, Feature 33
TU3-22	3-39	153	U.S. Army Stable, Feature 35

TABLE 15
ARCHAEOLOGICAL FEATURES RECORDED WITHIN VNHR AREA #3

Feature	Test Unit	Trench	Description
16	3-02	3-06	railroad tie and wood board
17	3-02	3-06	post and posthole
18	3-03	3-05	posthole
19	3-10	3-10	McLoughlin Road
20	n/a	3-09	concrete slab from coal pad
21	3-12	3-12	concrete post base
22	3-13	3-14	wood footing or post with vertical orientation
23	3-14, 3-15	3-14	Feature 66 pit from Thomas and Hibbs 1984
24	3-13	3-14	burned soil with 19^{th}-century artifacts
25	3-12	3-12	pit
26	3-13, 3-14	3-14	Feature 71 footing from Thomas and Hibbs 1984
27	3-19	3-32	two brick foundation piers
28	3-18	3-31	previous disturbance (possible Thomas and Hibbs 1984)
29	3-20	3-33	brick foundation pier
30	3-19	3-32	wood structural elements (base of Feature 27)
31	3-20	3-33	wood structural elements (base of Feature 29)
32	3-19	3-32	wood structural elements (base of Feature 27)
33	3-21	3-35	ash deposit with 19^{th}-century artifacts
34	-	3-39	brick wall or foundation
35	3-22	3-39	OP52B from Thomas and Hibbs 1984
36	3-13, 3-14	3-14	excavation baulk from Thomas and Hibbs 1984
37	-	3-14	excavation unit from Thomas and Hibbs 1984
38	3-08	3-10	pit feature

Eleven exploratory backhoe trenches (Trench 3-29 through Trench 3-39) and five TUs (TU3-18 through TU3-22) were excavated in the northern portion of VNHR Area #3 (Figure 64). Nine features (Features 27-35) were recorded. Backhoe trenches were excavated to the depth of B-horizon sediments or to the maximum reach of the backhoe. Profiles were drawn of a one-meter segment of each unit. Trenches deeper than 120 cm were profiled from the surface and lower stratum depths were approximated. Directions given in the text are relative to the orientation of the GPR grid: grid north is approximately 62° east of true north in the area of Trench 3-29 through Trench 3-34, and approximately 24° east of true north in the area of Trench 3-35 through Trench 3-39.

FIGURE 60. Northern grid area of NPS archaeological testing in VNHR Area #3 behind Building 402, facing grid north. (NPS 09-04:138-3816, 2/24/09)

FIGURE 61. Northern portion of the area of NPS archaeological testing in VNHR Area #3 at the fence corner behind Building 400, facing grid south. (NPS 09-04:138-3820, 2/24/09)

FIGURE 62. Northern portion of the area of NPS archaeological testing in VNHR Area #3 behind Building 400, facing grid east. (NPS 09-04:138-3822, 2/24/09)

FIGURE 63. Northern portion of the area of NPS archaeological testing in VNHR Area #3 behind Building 400, facing grid west. (NPS 09-04:138-3808, 2/24/09)

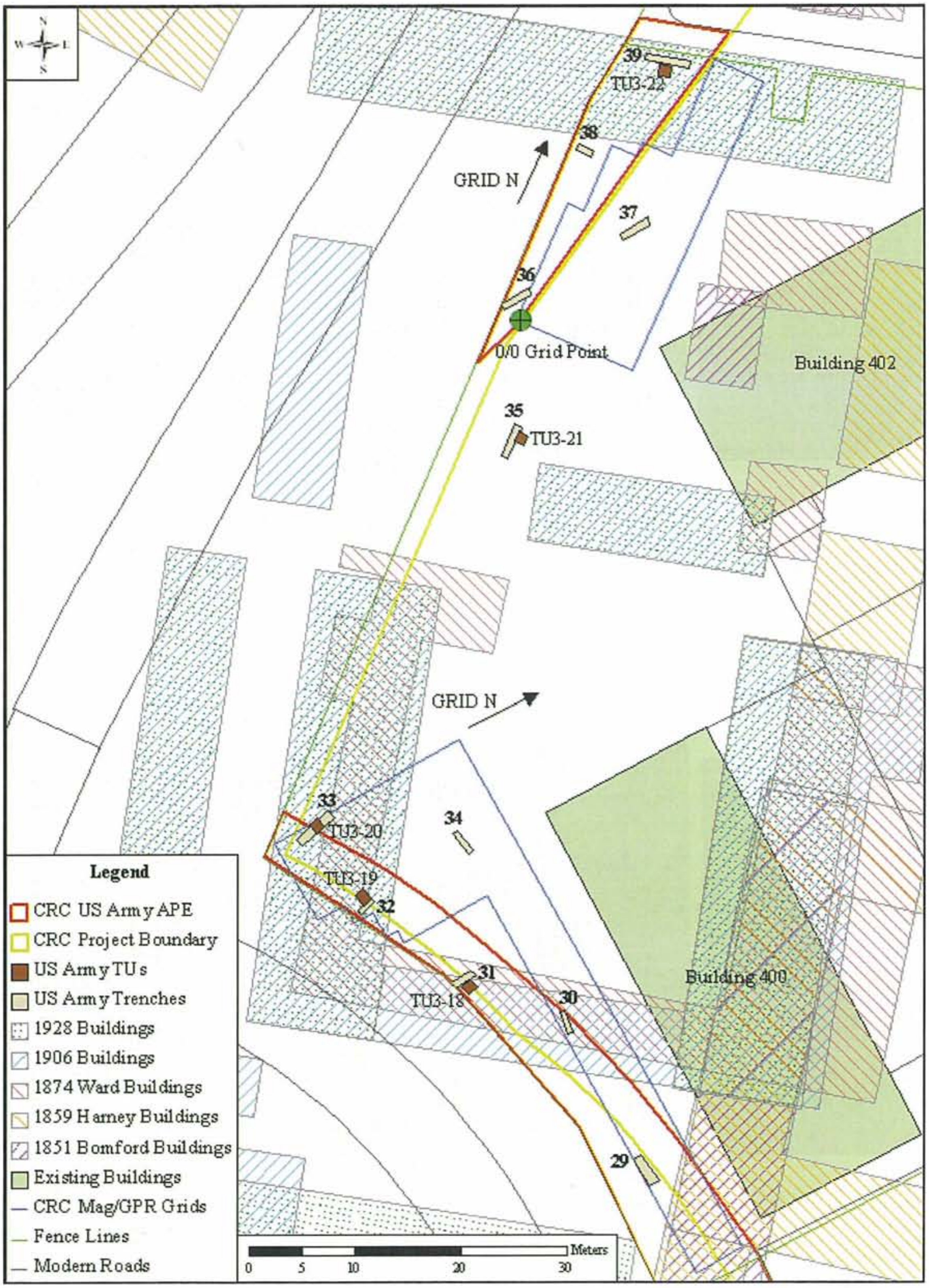

FIGURE 64. Backhoe trenches (numbered 29-39) and excavation units (TU3-18 through TU3-22) in the northern portion of VNHR Area #3. (NPS 2010)

The sediments throughout the northern portion of VNHR Area #3 are largely disturbed, with imported fill layers resting directly on B-horizon sediments in most locations. Many episodes of ground disturbance have affected different parts of the northern portion of VNHR Area #3, so the stratification observed is not consistent within this area. An example of the stratigraphic sequence for this area is described below for Trench 3-37 (Figure 65).

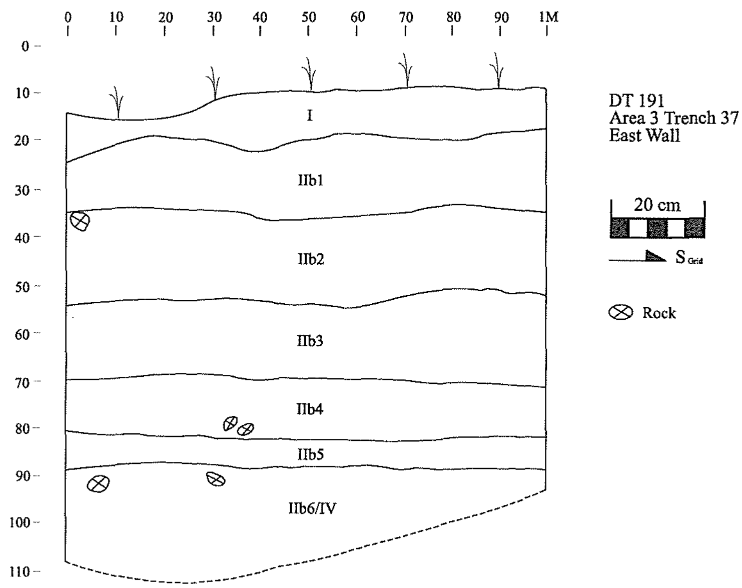

FIGURE 65. East wall profile of backhoe Trench 3-37 in the northern portion of VNHR Area #3. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR5/4 yellowish brown silt loam, 10% gravels, small roots, modern debris.
Stratum IIb1:	10YR5/3 brown sand, no artifacts.
Stratum IIb2:	10YR5/3 brown gravelly sand, no artifacts.
Stratum IIb3:	10YR4/2 dark grayish brown gravelly sand, no artifacts.
Stratum IIb4:	10YR3/2 very dark grayish brown silt loam, no artifacts.
Stratum IIb5:	10YR2/1 black early 20th-century macadam, no artifacts.
Stratum IIb6:	10YR3/2 very dark grayish brown silt loam, no artifacts.
Stratum IV:	B horizon, 10YR3/4 dark yellowish brown gravelly silt loam, culturally sterile.

U.S. Army Northern Area Backhoe Trenches

Trench 3-29

Trench 3-29 was excavated between Building 400 and the freeway ramp right-of-way fence in the area of a GPR anomaly. Sediments observed consisted of at least two fill episodes below the topsoil: 31 cm of dark yellowish brown silt, over more than 158 cm of dark grayish brown sand. B-horizon sediments were not reached before the trench was terminated at 210 cm. No buried cultural layer was present and few artifacts were observed. The GPR anomaly was judged to be caused by the deep Stratum IIb fill.

Trench 3-30

Trench 3-30 was excavated between Building 400 and the freeway ramp right-of-way fence in the area of a GPR anomaly. Sediments observed consisted of four fill episodes below the topsoil: 31 cm of dark yellowish brown sandy silt, over 12 cm dark yellowish brown silt, over 15 cm of dark grayish brown sand, over 55 cm of dark gray silty sand. B-horizon sediments were reached at 135 cm; the trench was terminated at 160 cm. No buried cultural layer was present and few artifacts were observed. The GPR anomaly was judged to be caused by the deep Stratum IIb fill.

Trench 3-31

Trench 3-31 was excavated extending grid north/south from the freeway right-of-way fence, grid west of Trench 3-30. Sediments observed consisted of four fill episodes below the topsoil over a buried cultural layer at 95 cm. B-horizon sediments were reached at 106 cm; the trench was terminated at 123 cm. The grab sample from the trench consisted of a moderate number of mixed 19th- and 20th-century artifacts. TU3-18 was excavated on the grid east side of the trench, 90 cm from the north end (see unit summary below).

Trench 3-32

Trench 3-32 was excavated off the northwest corner of Building 400 extending grid north/south from the freeway right-of-way fence. Sediments observed consisted of four fill episodes below the topsoil. A brick footing was observed on the grid west side of the trench beginning at 66 cm. B-horizon sediments were reached at 92 cm; the trench was terminated at a maximum depth of 178 cm. The grab sample from the trench consisted of several of mixed 19th- and 20th-century artifacts. TU3-19 was excavated on the grid west side of the trench, 10 cm from the north end, to further investigate the brick footing (see unit summary below).

Trench 3-33

Trench 3-33 was excavated in the freeway right-of-way fence corner northwest of Building 400. Sediments observed consisted of at least four fill episodes below the topsoil. A brick footing was observed approximately 230 cm from the grid north end of the trench beginning at 114 cm. B-horizon sediments were not reached before the trench was terminated at 120 cm. The grab sample from the trench consisted of a large number of mainly 20th-century artifacts. TU3-20 was excavated extending grid east from the trench 120 cm from the north end to further investigate the brick footing (see unit summary below).

Trench 3-34

Trench 3-34 was excavated off the northwest corner of Building 400. Sediments observed consisted of three fill episodes below the topsoil: 37 cm of dark yellowish brown silt, over 5 cm dark yellowish brown sandy loam, over 135 cm of very dark grayish brown coarse sand. B-horizon sediments were reached at the base of the trench at 190 cm. No buried cultural layer was present; no artifacts were observed other than small chunks of concrete, asphalt, and brick.

Trench 3-35

Trench 3-35 was excavated off the west side of Building 402. Sediments observed consisted of four fill episodes below the topsoil. A lens of ash and burned material above a thin coal lens was observed beginning at 96 cm. B-horizon sediments were not reached before the trench was terminated at 120 cm. The grab sample from the trench consisted of several mainly 20th-century artifacts. TU3-21 was excavated on the grid east side of the trench, 60 cm from the north end, to further investigate the ash deposit (see unit summary below).

Trench 3-36

Trench 3-36 was excavated off the northwest corner of Building 402 against the freeway right-of-way fence. Sediments observed consisted of four fill episodes below the topsoil: 25 cm of dark yellowish brown gravelly silt loam, over 4 cm of an early 20th-century macadam surface, over 30 cm dark yellowish brown gravelly sand, over 17 cm of dark brown silt loam. B-horizon sediments were reached at 87 cm; the trench was terminated at 125 cm. No buried cultural layer was present; no artifacts were observed other than small chunks of concrete, asphalt, and brick.

Trench 3-37

Trench 3-37 was excavated in a grassy area off the northwest corner of Building 402 in the location of a GPR anomaly. Sediments observed consisted of five fill episodes below the topsoil: 10 cm of yellowish brown sand, over 20 cm brown gravelly sand, over 15 cm of dark grayish brown gravelly sand, over 11 cm of very dark grayish brown silt loam, over 8 cm of an early 20th-century macadam surface. B-horizon sediments were reached at 79 cm; the trench was terminated at 103 cm. No buried cultural layer was present; no artifacts were observed other than a few small chunks of coal and brick. No apparent source of the GPR anomaly was located.

Trench 3-38

Trench 3-38 was excavated next to the freeway right-of-way fence grid south of East 5th Street. Sediments observed consisted of five fill episodes below the topsoil: 11 cm of yellowish brown silt loam, over 10 cm brown silt loam, over 4 cm of an early 20th-century macadam surface, over 16 cm of brown gravelly silt loam, over 11 cm of dark brown silt loam. B-horizon sediments were reached at 74 cm; the trench was terminated at 114 cm. No buried cultural layer was present; no artifacts were observed.

Trench 3-39

Trench 3-39 was excavated at the north end of this test area, next to the East 5th Street chain link fence near its junction with the Interstate 5 right-of-way fence. Sediments observed consisted of four fill episodes below the topsoil. No buried cultural layer was observed. The grab sample from this stratum consisted of a large number of mainly 19th-century artifacts. A brick wall/foundation was observed on the grid north side of the trench at 47 cm and was recorded as Feature 34. B-horizon sediments were not reached before the trench was terminated at 120 cm. TU3-22 was excavated on the grid south side of the trench, 140 cm from the northwest corner (see unit summary below).

Feature 34 consisted of a brick wall or foundation up to ten courses high and three bricks wide extending three meters along the grid north side of Trench 3-39 (Figure 66). The wall was made of local handmade sand-struck bricks set in a coarse sandy grayish-white mortar. The wall extended 47-118 cm below surface and was underlain by concrete on the grid west end. The upper course of brick had mortar on the top, which may suggest a missing course – or it may be the remains of a concrete pad visible in photographs taken after the building was demolished. Cultural material associated with Feature 34 consisted of a moderate number of mixed 19th- and 20th-century artifacts.

The building associated with Feature 34 is a wagon shed built in 1892. The June 30, 1928 Vancouver Barracks building inventory lists this structure as a "Wagon Shed & Vet. Isolation Hospital". The building was destroyed in the 1962 Columbus Day Storm and torn down in 1963, but a concrete pad at the building location continued to be used for parking until at least 1980.

FIGURE 66. Brick wall Feature 34 at 75 cm, on the grid north side of Trench 3-39. (NPS 09-13:2042, 6/30/09)

U.S. Army Northern Area Test Units

Data on the volume of sediments excavated and the number of artifacts recovered from the TUs in the northern portion of VNHR Area #3 are presented in Table 16.

TU3-18

TU3-18 was excavated on the grid east side of Trench 3-18, 90 cm grid south of the northwest corner, to investigate a concentration of 19th- and 20th-century artifacts observed while trenching. Sediments observed consisted of four fill episodes below the topsoil: 37 cm of dark yellowish brown sandy silt, over 24 cm dark brown yellowish silt, over 19 cm of dark grayish brown sand, over 11 cm of dark gray silty sand. An area of buried A-horizon sediments had been observed in a portion of the trench at 95 cm; however, the A horizon appeared to be largely missing in TU3-18. A moderate number of mixed 19th- and 20th-century artifacts were recovered, most likely redeposited or from a disturbed context. B-horizon sediments were reached at 97 cm; the unit was terminated at 112 cm. Feature 28, an area of contrasting soils marked by a line running east/west, was observed from 102-110 cm in the southeast corner of the unit. There are no known previous archaeological excavation units at this location, so it was assumed that the feature was associated with the construction of the freeway fence.

TU3-19

TU3-19 was excavated on the grid west side of Trench 3-32, 10 cm grid south of the northwest corner, to investigate a brick footing seen on the west side of the trench. The unit dimensions were expanded to 1 m north/south x 1.2 m east/west in order to expose the entire footing. A second footing was located slightly grid west of the first (Figures 67-68). Sediments observed consisted of four fill episodes below the topsoil: 30 cm of dark yellowish brown silt loam, over 38 cm dark grayish brown coarse silty sand with 40% gravels and cobbles, over 9 cm of brown silt, over 6 cm of dark yellowish brown silt loam. Stratum depths are approximate because the ground surface sloped 20-30 cm to grid south.

A buried cultural layer was observed within the unit levels beginning at 46 cm. The artifacts recovered from the upper 15 cm of this stratum consisted mainly of early 20th-century material. At depths greater than 70 cm (Unit Level 5, corresponding to the brick footings Feature 27 Level 1), artifacts were mostly 19th-century in origin. The presence of wire nails to a depth of 95 cm, however, indicates that these sediments are disturbed, probably during one of many renovations of the Quartermaster's Stable buildings. B-horizon sediments were reached at 92 cm within the unit levels; the unit was terminated at 138 cm.

Feature 27 consisted of two brick footings made of local handmade sand-struck brick (Figures 67-68). The western footing was 3 courses high, laid in a "2 on 2 4 ½" pattern (Thomas and Hibbs 1984:386). Thomas and Hibbs (1984:389) called this type of footing a brick pad. The pad was laid in coarse sand bedding, and extended 62-78 cm below surface.

TABLE 16
EXCAVATION RESULTS FOR THE NORTHERN PORTION OF VNHR AREA #3

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-18									
1	0-80	0.8000	-	-	-	-	-	-	-
2	80-89	0.0925	62	670	-	5	-	40	-
3	89-99	0.0975	7	72	-	3	18	4	-
4	99-107	0.0800	1	13	-	1	-	-	-
F28, L1	106-115	0.0045	-	-	-	-	-	-	-
5	107-117	0.0950	-	0	-	-	-	-	-
Total		1.1695	70	9	-	9	18	44	-
TU3-19									
1	0-43	0.8221	-	-	-	-	-	-	-
2	43-57	0.1526	59	387	1	2	-	7	-
3	57-61	0.0424	21	496	-	1	-	-	-
4	61-70	0.0989	93	941	-	-	25	18	1
F27, L1	68-78	0.1000	134	1340	-	1	3	32	1
5	70-80	0.0130	126	9692	1	1	5	13	-
F27, L2	78-89	0.1100	179	1627	1	-	8	26	-
6, 7	80-102	0.1257	1	1	-	-	-	1	-
F30, L1	89-96	0.0150	17	1137	-	-	1	3	-
F27, L3	89-103	0.0432	20	463	1	-	4	7	-
8	102-114	0.0720	13	181	-	-	-	-	-
F27, L4	104-119	0.0150	13	867	-	-	-	6	-
9	114-124	0.0228	32	1404	-	-	-	-	-
F32, L1	121-130	0.0152	5	329	-	-	-	4	-
10	124-136	0.0156	4	256	-	-	-	3	-
11	136-147	0.0143	24	1678	-	-	-	3	-
12	147-152	0.0065	1	154	-	-	-	1	-
Total		1.6841	741	440	4	5	46	124	2

Continued on next page

9516

TABLE 16
EXCAVATION RESULTS FOR THE NORTHERN PORTION OF VNHR AREA #3 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-20									
1	0-97	0.9625	-	-	-	-	-	-	-
2	97-109	0.1150	271	2357	-	-	3	14	-
3	109-119	0.0975	249	2554	2	6	3	40	-
4	119-127	0.0750	210	2800	-	2	6	101	-
5	127-136	0.0595	126	2118	-	-	-	-	-
F29, F31, L1	127-136	0.0255	201	7882	2	-	2	153	-
6	136-146	0.0884	11	125	-	-	3	1	-
7	146-156	0.0930	-	-	-	-	-	-	-
Total		1.5164	1068	704	4	8	17	309	-
TU3-21									
1	0-104	1.0375	-	-	-	-	-	-	-
2	104-109	0.0475	-	-	-	-	-	-	-
3	109-115	0.0141	177	12564	-	-	22	18	-
F33, L1	115-118	0.0180	240	13333	-	-	-	7	-
Total		1.1171	417	373	-	-	22	25	-
TU3-22									
1	0-10	0.1000	103	1030	2	28	20	9	-
2	10-16	0.0600	41	683	-	16	16	2	-
3	16-26	0.1025	29	283	-	15	4	6	-
4	26-36	0.0950	206	2168	2	25	51	49	11
5	36-46	0.1025	67	654	4	13	20	11	2
6a	46-72	0.0510	7	137	-	3	4	-	-
6b	53-64	0.0630	-	-	-	-	-	-	-
F35, L1	53-67	0.0280	18	643	1	4	2	5	-
7	72-83	0.0700	-	-	-	-	-	-	-
8	83-97	0.0975	-	-	-	-	-	-	-
Total		0.7695	471	612	9	104	117	82	13
GRAND TOTAL		**6.2566**	**2707**	**432**	**17**	**126**	**220**	**584**	**15**

*Personal and domestic items

The eastern footing bordered on Trench 3-32. This footing was nine courses high; courses were 1½ bricks wide with half bricks in the center. Thomas and Hibbs (1984:389) referred to this type of footing as a brick pier. The footing contained a substantial mortar that was up to 2 cm thick on the horizontal joints (1.5 cm on the vertical joints). The top course of bricks was offset slightly to grid east and had mortar on its upper surface, suggesting that there may have been at least one more course of bricks. The eastern footing extended more deeply into B-horizon sediments, at 65-133 cm below surface.

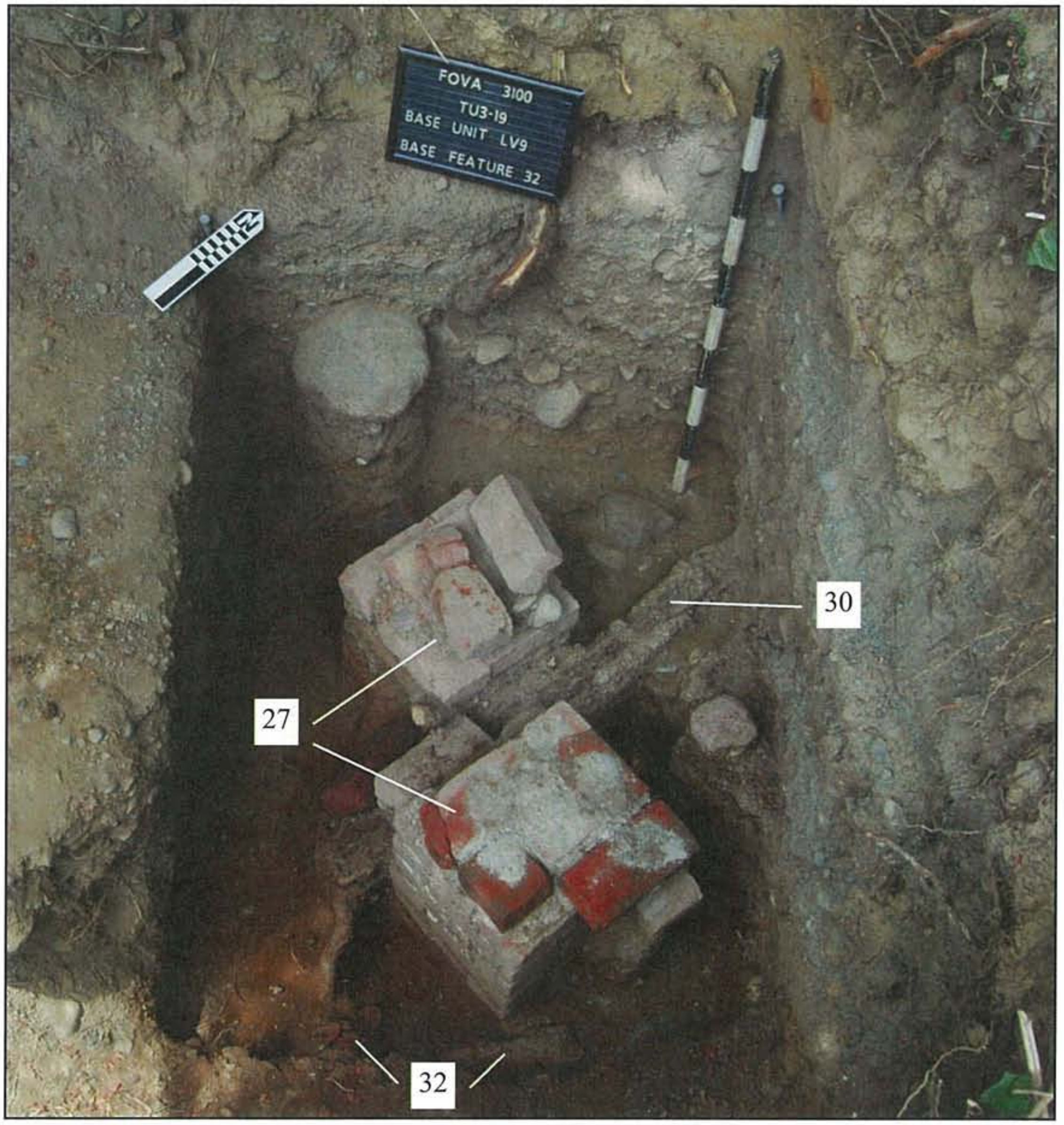

FIGURE 67. Quartermaster's Stable TU3-19 at the base of Unit Level 9 at 108 cm, showing Features 27, 30, and 32, facing grid west. (NPS 09-13:2022, 6/22/09)

The Feature 27 footings are associated with the Quartermaster's Stable complex present in this location from the early 1850s (Figures 67-68). The 1846 Covington map (Figure 53) shows an early corral located a little farther east. The 1851 and 1854 historical maps show the stable as a single building, which became the east arm of the later stable complex. By 1859, maps show a second stable building on the west, with sheds connecting the two stables on the north and south so that the four sides enclosed a corral. The 1871 and 1874 maps show the stable buildings in their final location in a "U"-shaped configuration with the open side on the north. Variations on this form persisted in this location into the early 1900s. By 1928, the southern building had been torn down and only the eastern and western buildings remained. These structures were demolished in 1935. Thomas and Hibbs (1984) conducted archaeological excavations of the Quartermaster's Stable complex (Operations 50 and 60) in this location in 1981 ahead of improvements to Interstate 5 and West Barracks.

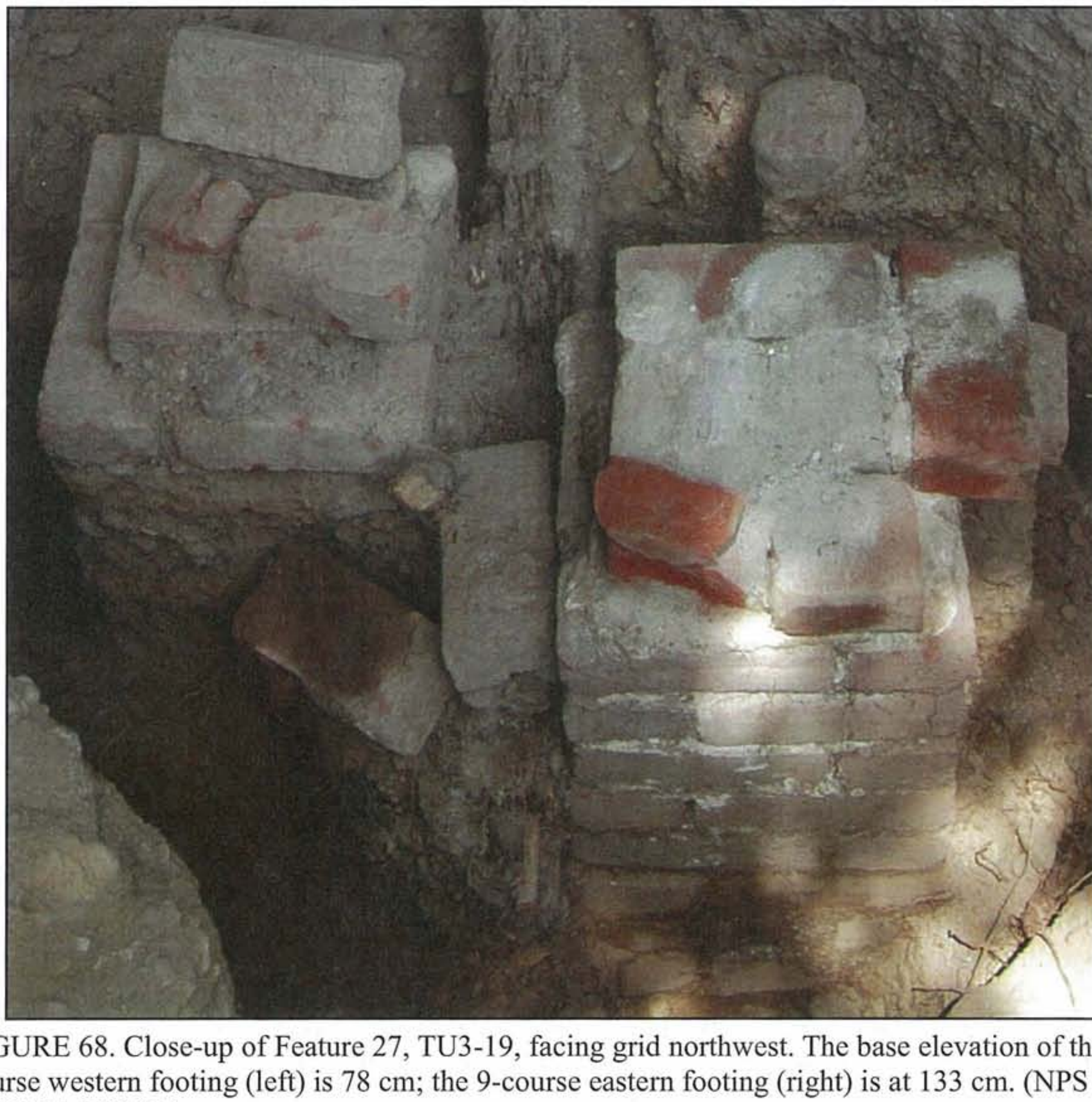

FIGURE 68. Close-up of Feature 27, TU3-19, facing grid northwest. The base elevation of the 3-course western footing (left) is 78 cm; the 9-course eastern footing (right) is at 133 cm. (NPS 09-13:2027, 6/23/09)

Historical accounts of the Quartermaster's Stable complex often mention that the buildings were falling over, would last only another year, needed new walls or foundations, etc. (Thomas and Hibbs 1984:635-636). In 1879, the stable was described as "out of repair and having had new underpinnings placed", with new weatherboards placed during the next fiscal year (Thomas and Hibbs 1984:636). Addington (in Chance and Chance 1976:288) reports that in 1879, the building was built on brick piers and had a wood floor. Thomas and Hibbs concluded that the 1879 repair event documented the shift from wood footings to brick pads and piers, dating Feature 27 to 1879-1914. Concrete blocks and slabs replaced brick pads and piers after 1914. Thomas and Hibbs (1984:680) surmise that the stable was simply elevated with each repair cycle and period of occupation. The elevations of the footings and the mortar types suggest that the brick pad represents an earlier foundation element and the brick pier represents a later foundation element.

Feature 30 (Figures 67-68) consisted of a wood board between the two Feature 27 footings at an elevation of 81-87 cm. The board is beneath the base of the western footing and above the base of the eastern footing. Feature 32 (Figures 67-68) consisted of wood fragments at the base of the eastern footing at an elevation of 110-120 cm. These wood features are probably associated with early wooden floor and foundation elements of the stable building.

TU3-20

TU3-20 was excavated extending grid east from Trench 3-33, 120 cm grid south of the northwest corner, to investigate a brick footing uncovered within the trench. Sediments observed consisted of four fill episodes below the topsoil: 37 cm of yellowish brown silt, over 14 cm of brown coarse sand, over 24 cm of gray coarse sand, over 28 cm of dark yellowish brown sandy loam with 20% gravels. A thin lens buried cultural layer was reached beginning at 120 cm. The artifacts recovered from this stratum consisted mainly of 19th-century material. The presence of wire nails to a depth of 138 cm, however, indicates that these sediments are disturbed, probably during one of many building renovation episodes. B-horizon sediments were reached at 142 cm; the unit was terminated at 148 cm.

Feature 29 consisted of a brick footing identical to the Feature 27 brick pad in TU3-19. The local handmade sand-struck bricks were 3 courses high, and laid in coarse sand bedding in a "2 on 2 4 ½" pattern (Thomas and Hibbs 1984:386). The footing extended 114-122 cm below surface. Feature 29 is most likely an 1879 foundation element from the western of the Quartermaster's Stable buildings. Feature 31 consisted of two wooden boards at the base of the Feature 29 footing at an elevation of 117-121 cm. These boards are assumed to be remnants of the stable floor or structural elements of the stable building.

TU3-21

TU3-21 was excavated on the grid east side of Trench 3-35, 50 cm grid south of the northwest corner, to investigate an ash deposit observed within the trench. Sediments observed consisted of four fill episodes below the topsoil: 20 cm of yellowish brown silt, above 52 cm of grayish brown silty sand with fine gravels, above 9 cm of dark grayish brown silty sand with fine gravels, above a 4 cm macadam surface. A thin cultural layer was reached at 96 cm and was designated Feature 33. Artifacts collected from the unit levels were mainly early 20th-century material, and were judged to all be associated with Feature 33. B-horizon deposits were reached at 108 cm; the unit was terminated at 121 cm.

Feature 33 was 5-7 cm thick, and consisted of ash and burned material (paper, bone, nails, leather, metal fragments, and charcoal). This feature appeared to be the result of a single burning episode. A thin coal lens was observed in a portion the unit at the base of Feature 33. A modest number of mainly early 20th-century artifacts were collected below the feature within the B-horizon deposits.

TU3-22

TU3-22 was excavated on the grid south side of Trench 3-39, 140 cm grid south of the northwest corner, to investigate a concentration of 19th-century artifacts seen while trenching. Sediments observed consisted of four fill episodes below the topsoil: 50 cm of yellowish brown silt, above 46 cm of brown silt loam with 65% gravels and construction rubble, above 8 cm of dark brown silt loam with 35% gravels and construction rubble.

A buried cultural layer was reached at 103 cm and extended to 118 cm in the western 80% of the unit, and to a depth of 146 cm in the southwest quadrant of the unit. A large number of predominantly 19th-century artifacts were recovered from this stratum. TU3-22 was located in what would have been a yard area between early U.S. Army buildings. After the mid-1880s, this area was beside Upper Mill Road (now East 5th Street). In the 1890s, a U.S. Army Stable building was constructed at this location. The artifacts recovered are likely from a trash deposit associated with these features. The eastern 20% of the unit, defined by contrasting soils in a line running approximately grid north/south, was designated Feature 35. A layer of plastic was evidence of a previous disturbance, which proved to be a portion of OP52B (Thomas and Hibbs 1984:405-410). The unit was terminated within C-horizon sediments at 153 cm.

U.S. Army Central Area

The central portion of West Barracks VNHR Area #3 was located in a landscaped area south of a chain link security fence at the southern edge of Building 400, extending approximately 90 m (295 ft.) south along the Interstate 5 right-of-way fence within 20 m (66 ft.) of the fence, to an asphalt parking lot (Figures 69-70). This area was the location of Building T-137, a U.S. Army structure of unknown function.

Twelve exploratory backhoe trenches (Trench 3-17 through Trench 3-28) and one TU (TU3-17) were excavated in the central portion of VNHR Area #3 (Figure 71). No features were observed. Backhoe trenches were excavated to the depth of B-horizon sediments or to the maximum reach of the backhoe. Profiles were drawn of a one-meter segment of each unit. Trenches deeper than 120 cm were profiled from the surface and lower stratum depths were approximated. Directions given are relative to the orientation of the GPR grid: grid north is approximately 62° east of true north.

FIGURE 69. Central portion of the area of NPS archaeological testing in VNHR Area #3 inside the gated security area south of Building 400, with McLoughlin Road heritage trees in the background, facing grid east. (NPS 09-04:138-3827, 2/24/09)

FIGURE 70. Central portion of the area of NPS archaeological testing in VNHR Area #3 inside the gated security area, showing McLoughlin Road heritage trees, facing grid north. (NPS 09-04:138-3839, 2/24/09)

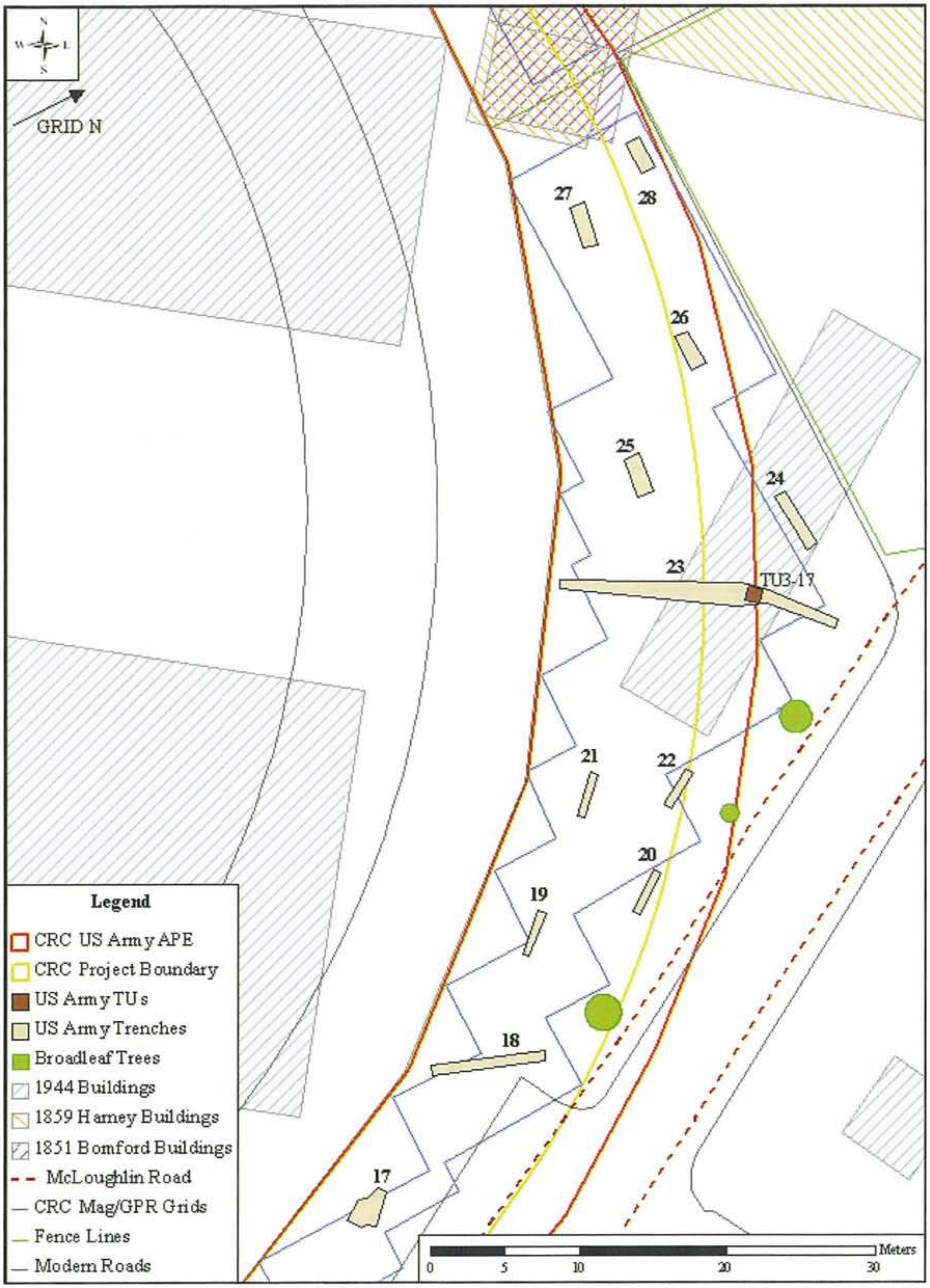

FIGURE 71. Backhoe trenches (numbered 17-28) and TU3-17 in the central portion of VNHR Area #3. (NPS 2010)

The sediments throughout the central portion of VNHR Area #3 are heavily disturbed, with imported fill layers resting directly on B-horizon sediments. Because of the many episodes of ground disturbance affecting different parts this area, the stratification observed is not consistent. The area of Trench 3-24 through Trench 3-28 had a more complex fill sequence with more fill episodes, presumably related to the construction of Building 400 in the 1980s. An example of the stratigraphic sequence for this area is described below for Trench 3-17 (Figure 72).

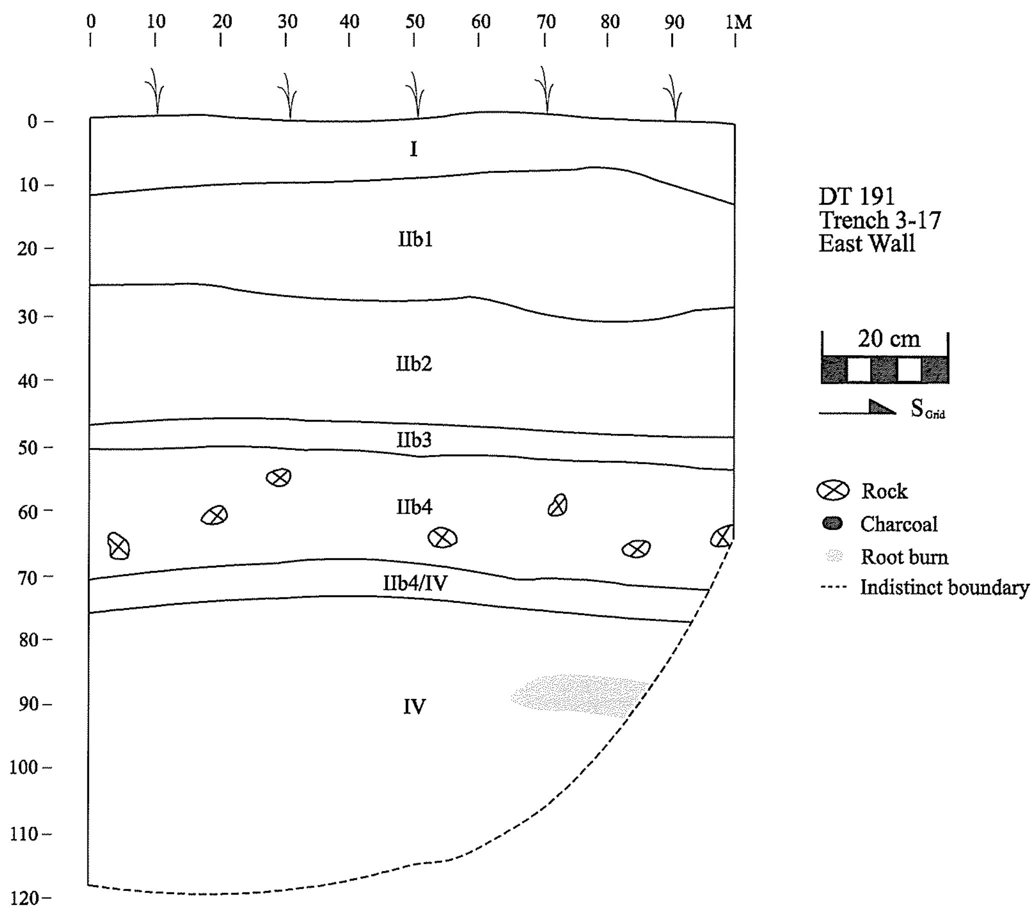

FIGURE 72. East wall profile of backhoe Trench 3-17 in the central portion of VNHR Area #3. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR3/4 dark yellowish brown silt loam, small roots.
Stratum IIb1:	10YR3/6 dark yellowish brown fine silt, no artifacts, PVC pipe in this stratum in the west wall of the trench.
Stratum IIb2:	10YR2/2 very dark brown sandy loam, no artifacts, irrigation control wires in this stratum in the west wall of the trench.
Stratum IIb3:	10YR2/1 black sandy loam, no artifacts.
Stratum IIb4:	10YR3/2 very dark grayish brown coarse sandy loam, no artifacts, metal storm sewer pipe in this stratum in the west wall of the trench.
Stratum IV:	B horizon, 10YR3/6 dark yellowish brown gravelly silt loam, culturally sterile.

U.S. Army Central Area Backhoe Trenches

Trench 3-17

Trench 3-17 was excavated between the freeway ramp right-of-way fence and the U.S. Army parking lot. Sediments observed consisted of four fill episodes below the topsoil: 14 cm of dark yellowish brown silt, over 21 cm of very dark brown sandy loam, over 4 cm of black sandy loam, over 20 cm of very dark brown sandy loam. A metal storm sewer pipe was observed in the west trench wall at about 60 cm. B-horizon sediments were reached at 71 cm; the trench was terminated at 120 cm. No buried cultural layer was present; no artifacts were observed.

Trench 3-18

Trench 3-18 was excavated across the project area from the freeway ramp right-of-way fence to the U.S. Army driveway, grid south of the heritage trees marking McLoughlin Road, to obtain a cross section of the sediments in this area. Sediments observed consisted of three fill episodes below the topsoil: 15 cm of dark yellowish brown silt, over 23 cm of dark brown sandy loam, over 10 cm of very dark brown coarse sandy loam. B-horizon sediments were reached at 120 cm at the grid south end of the trench and at 55 cm at the grid north end of the trench; the trench was terminated at 120 cm. No buried cultural layer was observed. The grab sample from the trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-19

Trench 3-19 was excavated parallel to and near the freeway ramp right-of-way fence opposite the southern of the three heritage trees marking McLoughlin Road. Sediments observed consisted of three fill episodes below the topsoil: 19 cm of dark yellowish brown silt, over 20 cm of very dark brown sandy loam, over 20 cm of very dark grayish brown sandy loam with 35% angular gravels. B-horizon sediments were reached at 71 cm; the trench was terminated at 107 cm. No buried cultural layer was present, and no artifacts were observed.

Trench 3-20

Trench 3-20 was excavated in a low area between and slightly grid west of the two southern heritage trees marking McLoughlin Road. Sediments observed consisted of one fill episode of 34 cm of dark brown silt loam below the topsoil. A possible thin buried cultural layer was observed in the south end of the trench at 54 cm but no artifacts were present. B-horizon sediments were reached at 56 cm; the trench was terminated at 62 cm. A few late 19th- or early 20th-century artifacts were collected from the fill stratum.

Trench 3-21

Trench 3-21 was excavated parallel to and near the freeway ramp right-of-way fence opposite the middle of the three heritage trees marking McLoughlin Road. Sediments observed consisted of three fill episodes below the topsoil: 18 cm of dark yellowish brown silt, over 37 cm of very dark brown coarse sandy loam, over 15 cm of dark brown silt loam. B-horizon sediments were reached at the base of excavations at 76 cm. No buried cultural layer was present. The grab sample from the trench consisted of few mixed 19th- and 20th-century artifacts.

Trench 3-22

Trench 3-22 was excavated grid west of the middle of the three heritage trees marking McLoughlin Road. Sediments observed consisted of one fill episode of 53 cm of dark brown silt loam below the topsoil. B-horizon sediments were reached at 84 cm; the trench was terminated at 90 cm. No buried cultural layer was present, and no artifacts were observed.

Trench 3-23

Trench 3-23 was excavated across the project area from the freeway ramp right-of-way fence to the U.S. Army driveway, grid north of the heritage trees marking McLoughlin Road, to obtain a cross section of the sediments in this area. Sediments observed consisted of four fill episodes below the topsoil, including a buried macadam road surface. B-horizon sediments were reached at 71 cm at the south end of the trench. Fill sediments were much deeper – up to 150 cm – grid north of an irrigation pipe located 12 m from the south end of the trench. The trench was terminated at a depth of 150 cm. Several mixed 19th- and 20th-century artifacts were recovered beginning 4 m from the south end of the trench. The frequency of this material increased toward grid north, closer to the location of Building T-137, which was demolished in the 1980s. TU3-17 was excavated on the west side of the trench 13.8 m grid north of the south end (see unit summary below).

Trench 3-24

Trench 3-24 was excavated grid west of the northern heritage tree marking McLoughlin Road, and south of a motor pool chain link fence south of Building 400. Sediments observed consisted of three fill episodes below the topsoil: 13 cm of dark yellowish brown sandy silt, over 21 cm of yellowish brown silt, over 92 cm of dark grayish brown sand. B-horizon sediments were reached at 134 cm; the trench was terminated at 143 cm. No buried cultural layer was observed. The grab sample from the trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-25

Trench 3-25 was excavated grid west of the historical McLoughlin Road, south of a motor pool chain link fence south of Building 400, and parallel to and near the freeway right-of-way fence. Sediments observed consisted of four fill episodes below the topsoil: 24 cm of yellowish brown silt loam, over 45 cm of dark grayish brown sand, over 7 cm of very dark grayish brown silt loam, over 18 cm of very dark grayish brown sand with 40% gravels. B-horizon sediments were reached at 127 cm; the trench was terminated at 140 cm. No buried cultural layer was observed. The grab sample from the trench consisted of few 20th-century artifacts.

Trench 3-26

Trench 3-26 was excavated grid west of the historical McLoughlin Road and south of a motor pool chain link fence south of Building 400. Sediments observed consisted of four fill episodes below the topsoil: 12 cm of dark brown fine sand, over 12 cm of dark yellowish brown fine sand, over 29 cm of brown coarse sand, over 34 cm of very dark grayish brown coarse sand. An apparent buried cultural layer was reached at 99 cm but only a few 20th-century artifacts were collected. This material was thought to be associated with Building T-137. B-horizon sediments were reached at 148 cm; the trench was terminated at 159 cm.

Trench 3-27

Trench 3-27 was excavated grid west of the historical McLoughlin Road near the intersection of two chain link fences south of Building 400, and parallel to and near the freeway right-of-way fence. Up to seven layers of fill were observed below the topsoil (Figure 73): 8 cm of dark brown sand, over 4 cm of dark grayish brown fine sand, over 10 cm of yellowish brown silty sand, over 23 cm of dark grayish brown coarse sand, over 3 cm of dark yellowish brown coarse sand with 30% gravels, over 7 cm of very dark grayish brown sand with 40% gravels, over 17 cm of dark grayish brown sand with 5-7% gravels. B-horizon sediments were reached at 111 cm; the trench was terminated at 122 cm. No buried cultural layer was observed. The grab sample from the trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-28

Trench 3-28 was excavated grid west of the historical McLoughlin Road and near the intersection of two chain link fences south of Building 400. Sediments observed consisted of four fill episodes below the topsoil: 19 cm of dark yellowish brown silty sand, over 30 cm of dark grayish brown coarse sand, over 32 cm of very dark gray very coarse sand, over 59 cm of dark brown coarse sand with 15% gravels. B-horizon sediments were reached at 159 cm; the trench was terminated at 163 cm. No buried cultural layer was observed. The grab sample from the trench consisted of few mixed 19th- and 20th-century artifacts.

FIGURE 73. West wall of backhoe Trench 3-27 at 122 cm, showing the many distinct fill layers near Building 400. (NPS 09-13:1995, 6/9/09)

U.S. Army Central Area Test Unit

Data on the volume of sediments excavated and the number of artifacts recovered from the TU in the central portion of VNHR Area #3 are presented in Table 17.

TABLE 17
EXCAVATION RESULTS FOR THE CENTRAL PORTION OF VNHR AREA #3

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-17									
1	0-108	1.0750	-	-	-	-	-	-	-
2	108-119	0.1025	437	4263	-	10	-	12	-
3	119-123	0.0375	151	4027	2	6	-	15	-
4	123-130	0.0725	57	786	13	6	9	2	1
5	130-140	0.1000	-	-	-	-	-	-	-
6	140-150	0.1000	-	-	-	-	-	-	-
Total		1.4875	645	434	15	22	9	29	1

*Personal and domestic items

TU3-17

TU3-17 was excavated on the grid west side of Trench 3-23, 5.4 m grid south of the northwest corner, to investigate cultural material associated with Building T-137, which was demolished in the 1980s during the last freeway-widening project. Building T-137 measured 101 x 20.5 ft. and was described as a "wooden structure without a foundation" on the plans for improvements to the U.S. Army installation at Vancouver Barracks dated September 1, 1982.

Sediments observed consisted of four fill episodes below the topsoil: 31 cm of yellowish brown silt, over 34 cm of very dark gray sand, over 28 cm of very dark grayish brown silty sand. A buried cultural layer was reached at 104 cm, and contained a large number of mainly 20th-century artifacts. Most of this material can be attributed to demolition debris from Building T-137. A few 19th-century artifacts were recovered, which may have been present in this location before the construction of Building T-137 or redeposited from a wider area during any of a number of episodes of ground disturbance. B-horizon sediments were reached at 129 cm; the unit was terminated at 141 cm.

U.S. Army Southern Area

The southern portion of West Barracks VNHR Area #3 was located in a landscaped area south of a chain link security fence, extending approximately 115 m (377 ft.) along the freeway right-of-way fence south from an asphalt parking lot, and then east to the chain link fence boundary with Fort Vancouver National Historic Site (Figures 74-77). The project area was within 15 m (50 ft.) of the freeway right-of-way fence.

Sixteen exploratory backhoe trenches (Trench 3-01 through Trench 3-16) and 16 TUs (TU3-01 through TU3-16) were excavated in the southern portion of VNHR Area #3 (Figure 78). Fourteen features (Features 16-26, 36-38) were recorded. In this area, backhoe trenches were excavated to ascertain if intact A-horizon sediments were present below the 1980s fill layers. Trenching stopped when it was determined that intact Village sediments were present. In those cases where intact Village sediments were not identified, trenching continued to the depth of B-horizon sediments, or to the maximum reach of the backhoe. Evergreen trees planted in the 1980s in the area of Trench 3-01 through Trench 3-10 created obstructions to exploratory trenching. Profiles were drawn of a one-meter segment of each unit. Trenches deeper than 120 cm were profiled from the surface and lower stratum depths were approximated. Directions given in the text are relative to the orientation of the GPR grid: grid north is approximately 62° east of true north.

The sediments in much of the southern portion of VNHR Area #3 reflect the same numerous fill episodes seen in the northern and central portions of this area. However, throughout most of this area, the fill layers rest directly on intact HBC Village Stratum III A horizon. This stratum is wholly or partially stripped in some areas; in other areas it is totally undisturbed. Very few artifacts were observed above the buried A horizon, although coal was typically present at the former location of the coal storage pad. The stratigraphic sequence observed in areas with intact A horizon is described within the discussions of the 16 TUs excavated to explore these deposits. An example of the stratigraphic sequence in an area where the A horizon has been totally stripped is described below for Trench 3-01 (Figure 79).

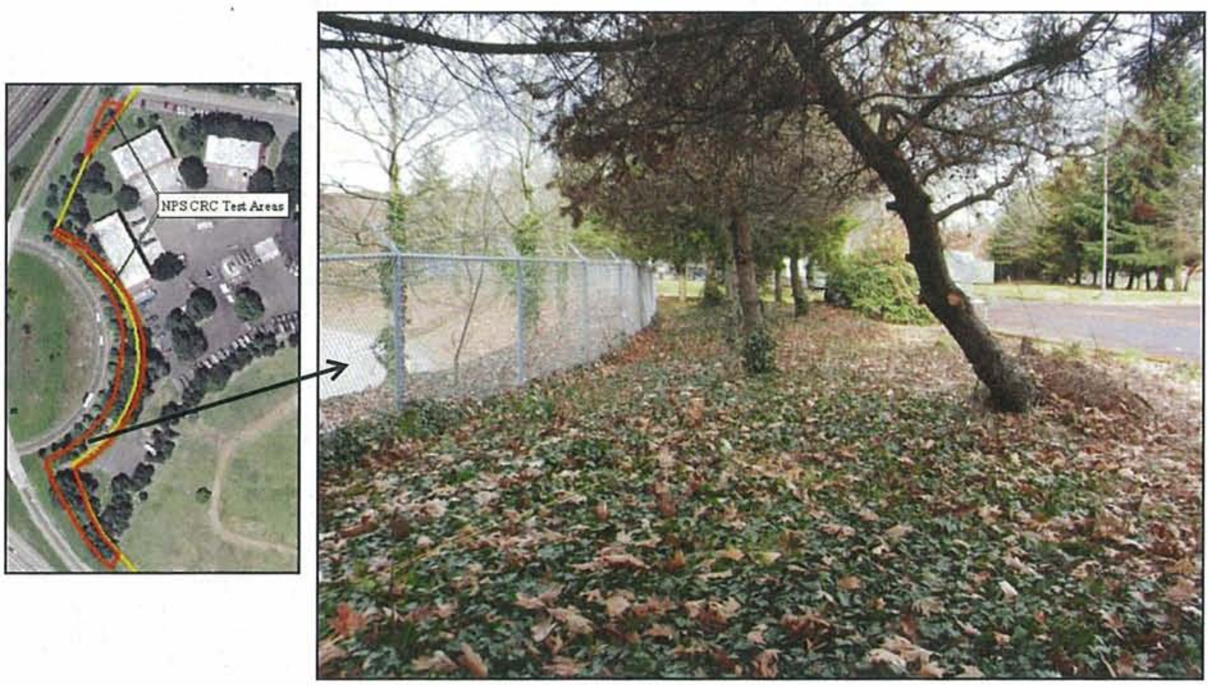

FIGURE 74. Southern portion of the area of NPS archaeological testing in VNHR Area #3 inside the U.S. Army gated security area, facing grid north. (09-04:138-3836, 2/24/09)

FIGURE 75. Southern portion of the area of NPS archaeological testing in VNHR Area #3 inside the U.S. Army gated security area, facing grid east. McLoughlin Road heritage trees are on the right. (NPS 09-04:138-3835, 2/24/09)

FIGURE 76. Jacqueline Cheung next to one of the McLoughlin Road heritage trees in the southern portion of the area of NPS archaeological testing in VNHR Area #3 inside the U.S. Army gated security area, facing grid east. (NPS 09-04:138-3806, 2/23/09)

FIGURE 77. Southeast corner of the southern portion of the area of NPS archaeological testing in VNHR Area #3 inside the U.S. Army gated security area, facing grid west. McLoughlin Road heritage trees are in the center background. (NPS 09-04:138-3833, 2/24/09)

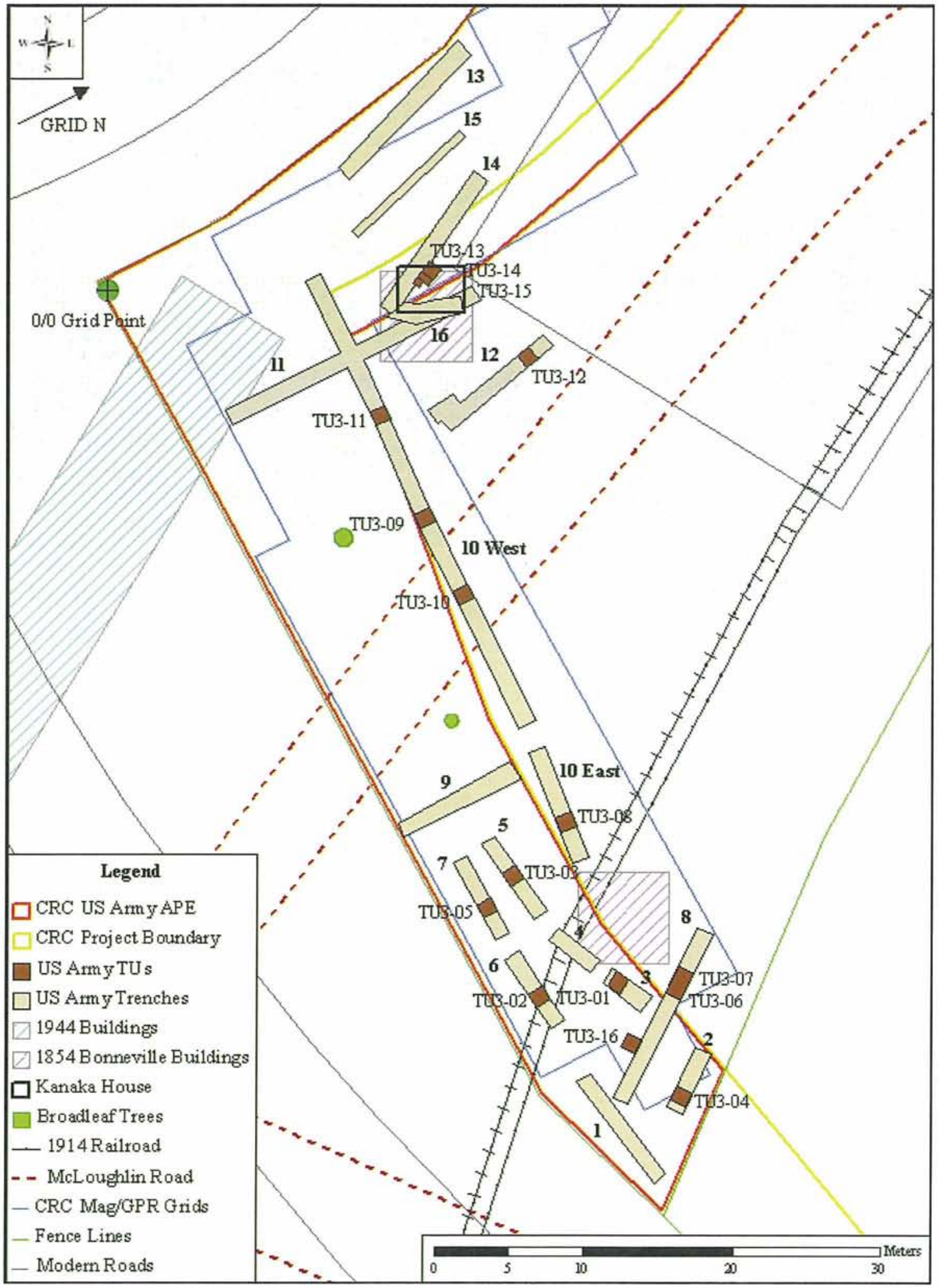

FIGURE 78. Backhoe trenches (numbered 1-16) and excavation units (TU3-01 through TU3-16) in the southern portion of VNHR Area #3. (NPS 2010)

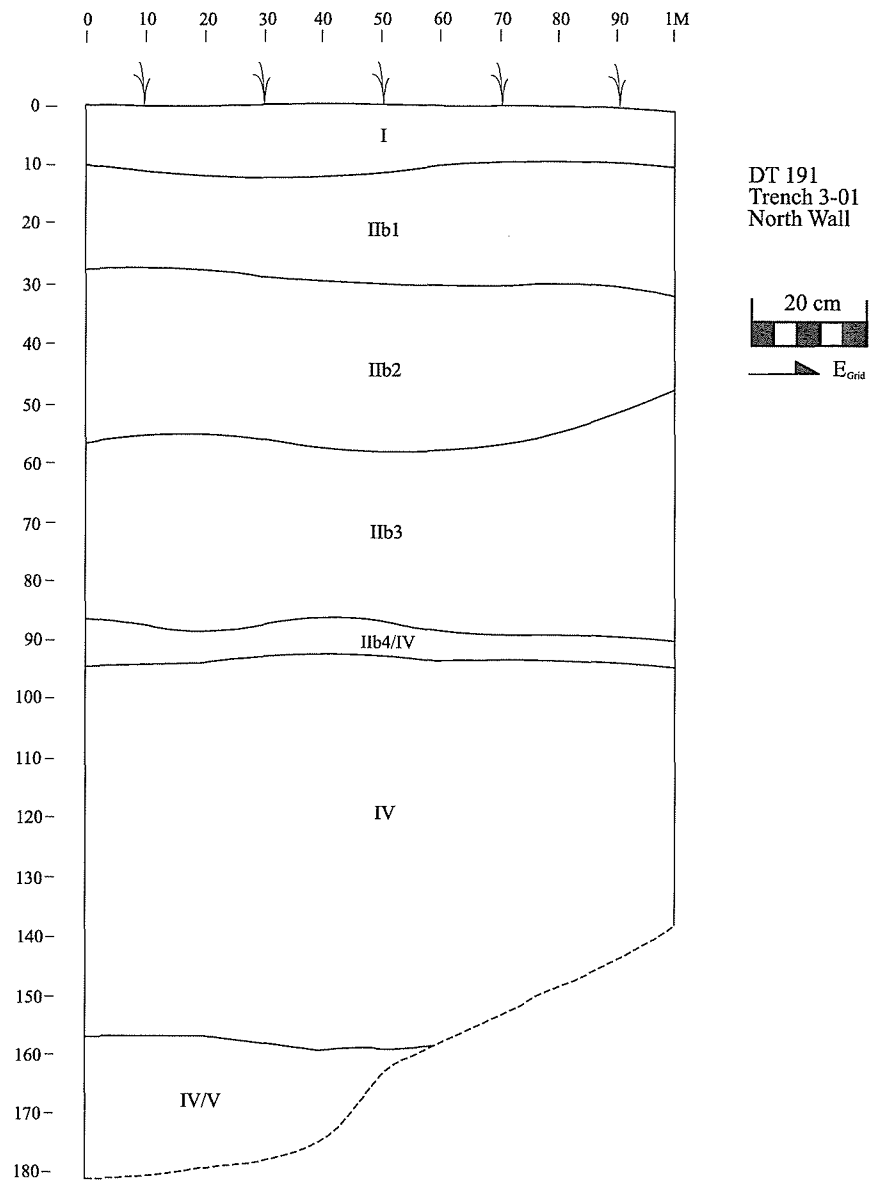

FIGURE 79. North wall profile of backhoe Trench 3-01 in the southern portion of VNHR Area #3. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR3/4 dark grayish brown silt loam, ivy and small roots.
Stratum IIb1:	10YR3/6 dark yellowish brown silt loam mottled with 15% Stratum I, no artifacts.
Stratum IIb2:	10YR4/1 dark gray sand, no artifacts.
Stratum IIb3:	10YR5/1 gray sand, no artifacts.
Stratum IIb4:	10YR4/4 dark yellowish brown silt loam mottled with gray sand and gravels, no artifacts.
Stratum IV:	B horizon, 10YR3/4 dark yellowish brown gravelly silt loam, culturally sterile.
Stratum V:	C horizon, loose sand and gravels, culturally sterile.

U.S. Army Southern Area Backhoe Trenches

Trench 3-01

Trench 3-01 was excavated parallel to the SR 14 right-of-way fence beginning in the grid southeast corner of the project area. Sediments observed consisted of three fill episodes below the topsoil: 18 cm of dark yellowish brown silt loam (redeposited B horizon?), over 30 cm of gray sand, over 28 cm of light gray sand. A/B-horizon transitional deposits were reached at 86 cm; the B horizon was reached at 94 cm; the C horizon was below 156 cm. No artifacts and no buried cultural layer were observed.

Trench 3-02

Trench 3-02 was located parallel to the NPS Village fence beginning at the grid southeast corner of the project area. A possible well/cistern anomaly was detected in this area during the GPR survey. Sediments observed consisted of three fill episodes below the topsoil. The A horizon in this trench was largely missing; B-horizon deposits were reached at 50 cm; the trench was terminated at 56 cm. The grab sample from the trench consisted of several mixed 19th- and 20th-century artifacts. No apparent source of the GPR anomaly was located. TU3-04 was excavated 290 cm from the grid north end of this trench (see unit summary below).

Trench 3-03

Trench 3-03 was excavated in the vicinity of Tayentas House seen on the 1846 Covington map (Figure 53). Three fill strata similar to those seen in Trench 3-01 were observed over a buried A horizon at 84 cm. In a portion of the trench, B-horizon sediments were observed at 90 cm. A grab sample from the trench contained a very large number of 19th-century domestic artifacts. TU3-01 was excavated 50 cm from the grid west end of this trench (see unit summary below).

Trench 3-04

Trench 3-04 was excavated grid southwest of Trench 3-03 to evaluate the extent of deposits associated with Tayentas House. Sediments observed consisted of three fill episodes below the topsoil: 40 cm of dark yellowish brown silt loam, over 45 cm of gray sandy silt, over 10 cm of machine-cut gravel. The sediments appear to have been disturbed by the overlying railroad grade. B-horizon sediments were reached at 104 cm; the trench was terminated at 114 cm. No buried A horizon was observed; one large spike was collected as a grab sample from near the top of fill sediments.

Trench 3-05

Trench 3-05 continued the line of trenches extending grid west from Trench 3-03 and Trench 3-04 to evaluate the extent of deposits associated with Tayentas House. Sediments observed consisted of five fill episodes over a buried A horizon at 94 cm. In a portion of the trench, B-horizon sediments were observed at 107 cm; the trench in this area was terminated at 110 cm. The grab sample from this trench consisted of three large pieces of coal and a large bolt with two nuts collected from near the top of fill sediments. TU3-03 was excavated 240 cm from the grid west end of the trench (see unit summary below).

Trench 3-06

Trench 3-06 was excavated grid west of Trench 3-01 to evaluate the extent of deposits associated with Tayentas House. Sediments observed consisted of four fill layers over a buried A horizon at 94 cm. A portion of the trench was excavated deeper, to 112 cm. The grab sample consisted of a large number of 19th-century domestic artifacts, and four metal spikes collected from near the top of fill sediments. TU3-02 was excavated 280 cm from the grid west end of the trench (see unit summary below).

Trench 3-07

Trench 3-07 was excavated grid west of Trench 3-06 to evaluate the extent of deposits associated with Tayentas House. Sediments observed consisted of six fill layers over a buried A horizon at 118 cm. In part of the trench, B-horizon sediments were observed at 120 cm, and this portion of the trench was terminated at 125 cm. The grab sample from this trench consisted of several 19th-century artifacts. A railroad tie was observed at a depth of 40 cm across the grid west end of the trench. TU3-05 was excavated 320 cm from the grid west end of the trench (see unit summary below).

Trench 3-08

Trench 3-08 was excavated grid west of and parallel to Trench 3-02 to evaluate the extent of deposits associated with Tayentas House. Sediments observed consisted of three fill layers over a buried A horizon at 80 cm. In part of the trench, B-horizon sediments were observed at 90 cm, and this portion of the trench was terminated at 120 cm. The grab sample from this trench consisted of a moderate number of 19th-century domestic artifacts mixed with a few wire nails and metal objects that may be associated with the railroad. TU3-07 and TU3-06 were excavated 290 cm and 380 cm respectively from the north end of the trench; TU3-16 was excavated 8.4 m from the grid north end of the trench (see unit summaries below).

Trench 3-09

Trench 3-09 was excavated grid west of Trench 3-05 and Trench 3-07 to obtain a cross section from grid north to south of the sediments west of Tayentas House. Sediments observed consisted of at least two fill layers below the topsoil: 20 cm of dark brown sandy loam, over 5 cm of very dark grayish brown sandy loam with 40% gravels. Both layers contained chunks of concrete debris. An impenetrable concrete slab, a probable remnant of the concrete coal pad that was located throughout this area, was encountered at 35 cm in the north end of the trench. The concrete slab was recorded as Feature 20. The grab sample from this trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-10

Trench 3-10 was excavated the length of the grid south area of VNHR Area #3 to obtain a grid east/west cross section of the sediments west of Tayentas House. Kanaka House, seen on the 1846 Covington map (Figure 53) and partially excavated in 1981 ahead of freeway improvements (Thomas and Hibbs 1984:312-324), was located near the western end of this trench. Roads leading to the waterfront since at least the 1850s crossed this area. The 1859-1878 historical maps show a road (which became McLoughlin Road in the 1880s) passing between Tayentas House and Kanaka House. Heritage trees planted in the 1880s still mark the boundary of this road (Figures 69-70, 75-77).

Trench 3-10 extended for 43.2 m, but was discontinuous. The grid east part of the trench, also referred to as Trench 3-10 East, was 8 m long and was separated from the main part of Trench 3-10 by a gap of 180 cm. Sediments observed in the eastern part of the trench consisted of three fill layers over a buried A horizon at 75 cm. In part of the trench, B-horizon sediments were reached higher in the profile at 67 cm. TU3-08 was excavated within this area.

The main part of Trench 3-10 to grid west was 33.4 m long. This area was lower in elevation than the location of the former railroad berm to the east, and generally appears more disturbed. Fill sediments observed consisted of only two layers; the gray sand layer seen to grid east disappeared within nine meters of the east end of the main part of the trench. The western 4.5 m of the trench had a layer of machine-cut gravels at 40-50 cm, possibly associated with a storm sewer and manhole west of the end of the trench. The A horizon, where present, consisted of a thin lens that began 18-27 cm and extended to 34-37 cm. In places, B-horizon sediments were reached at a depth of 30-40 cm.

Grab samples were collected during trenching at approximately 10 m intervals. The quantity of cultural material observed increased toward grid east. No artifacts were observed from 0-20 m E; only a few artifacts were collected from 20-30 m E. The grab sample from 30-50 m E consisted of a very large number of mainly 19th-century domestic artifacts.

Test units were excavated within Trench 3-10 to sample the distribution of cultural material along this transect. Units were excavated 40 m (TU3-08), 23 m (TU3-10), 17.3 m (TU3-09), and 9.75 m (TU3-11) from the grid west end of the trench (see unit summaries below). A profile was drawn 31.5 m from the grid west end to record the stratigraphy in an area where no units were excavated.

Trench 3-11

Trench 3-11 was excavated from grid north to south across the south area of VNHR Area #3 near its west end to obtain a cross section of the sediments in this area, to investigate a GPR anomaly detected in this area, and to attempt to relocate the 1981 Kanaka House excavation block. Trench 3-11 was 18.7 m long and crossed Trench 3-10 approximately 12.5 m grid north of the freeway fence.

The number and characteristics of fill sediments below the topsoil varied along the length of the trench. Sediments observed grid south of Trench 3-10 had 47 cm of dark brown sand, over 5 cm of dark gray sand with 80-90% machine-cut gravels, over B-horizon sediments at 82 cm. Concrete chunks were present in the sediments, and a vertical salt-glazed red terracotta sewer pipe was observed at the bottom of the trench. The portion of Trench 3-11 just north of Trench 3-10 had 9 cm of dark yellowish brown silt loam, over 14 cm of dark brown silt loam with 15% gravels, over 8 cm of dark brown silty sand with 20% gravels, over 10 cm of very dark brown silt loam with 15% gravels, over B-horizon sediments at 50 cm. Sediments observed at the far grid north end of Trench 3-11 consisted of 22 cm of yellowish brown silt loam, over 13 cm of brown sandy loam with 15% gravels, over 14 cm of very dark brown sandy loam, over 10 cm of black sandy loam, over B-horizon sediments at 66 cm. This trench was terminated at 100 cm.

The grab sample from Trench 3-11 consisted of a very large piece of coal and a small quantity of mostly 19th-century artifacts. In this area, however, intact A-horizon deposits were not observed and no test unit was excavated within the trench. The 1981 Kanaka House excavation block was not observed, although later trenching showed that the trench had cut through the corner of the block.

Trench 3-12

Trench 3-12 was excavated grid north of Trench 3-10 and grid east of Trench 3-11, to investigate a surface depression possibly associated with Kanaka House. Sediments observed consisted of four fill episodes. In the grid south end of the trench, B-horizon sediments were reached at 43 cm, and trenching stopped at 50 cm. In the grid north end of the trench, a buried A horizon was encountered at 58 cm. The surface depression proved not to be Kanaka House, and was assumed to have been associated with U.S. Army activities. The grab sample recovered from the northern part of the trench contained a large number of mainly 19th-century domestic artifacts. TU3-12 was excavated 130 cm from the grid north end of this trench (see unit summary below).

Trench 3-13

Trench 3-13 was excavated parallel to the freeway right-of-way fence on the grid west end of this portion of the project area. Sediments observed consisted of at least three fill episodes below the topsoil: 10 cm of dark yellowish brown silt loam, over 17 cm of dark brown silty sand, over 5 cm of very compact gravelly black loamy sand with chunks of asphalt and concrete road debris. The smooth backhoe bucket could not penetrate the final fill layer and the trench was terminated at 50 cm. No buried A horizon was observed. The grab sample from the trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-14

Trench 3-14 was excavated in the presumed area of the 1981 Kanaka House excavation block. Sediments below the topsoil in the far grid north portion of the trench consisted of a dark yellowish brown silt loam over an impenetrable very compact gravelly dark grayish brown sandy loam with chunks of asphalt and concrete road debris at 32 cm.

Sediments in the grid central and south portions of Trench 3-14 consisted of four fill episodes over a buried A horizon at 65 cm. The trench inadvertently cut through the northwestern unit of the 1981 Kanaka House excavation block, designated Feature 37, which was visible in the profile of the south portion of the trench at a depth of 54-88 cm (Figure 80). The grab sample from the trench consisted of a very large quantity of mainly 19th-century domestic artifacts. B-horizon sediments were reached at the bottom of the trench at 100 cm. TU3-13, TU3-14, and TU3-15 were excavated on the grid east side of Trench 3-14 beginning 6.6 m from the grid north end of the trench (see unit summaries below).

At the end of test unit excavations, Trench 3-14 was widened to more accurately map the 1981 Kanaka House excavation block by exposing the block's western corners. Fill sediments were stripped only as far as necessary to reveal the tops of the corners of the block, and the west portion of the north, south, and west boundary lines (see Trench 3-16 below).

Trench 3-15

Trench 3-15 was excavated between Trench 3-13 and Trench 3-14 to evaluate the extent of cultural material associated with Kanaka House to grid east. Sediments observed consisted of three fill episodes below the topsoil: 20 cm of dark yellowish brown loamy silt, over 24 cm of very dark grayish brown sand with 25% gravels, over 10 cm of dark gray sand with 30% gravels. B-horizon sediments were reached at 83 cm; the trench was terminated at 85 cm. No buried A horizon was observed. The grab sample from the trench consisted of a few mixed 19th- and 20th-century artifacts.

Trench 3-16

Trench 3-16 was excavated along the grid south boundary of the 1981 Kanaka House excavation block (Thomas and Hibbs 1984:312-324) to more accurately map the location of those units and features. Trench 3-14 was widened to expose the block's west side. Trench 3-16 was then excavated grid east from Trench 3-14 through the top portion of fill sediments to expose the south boundary line. The grab sample from the trench consisted of a moderate number of 19th-century domestic artifacts mixed with a few wire nails and a railroad spike. The trench was terminated at 55 cm.

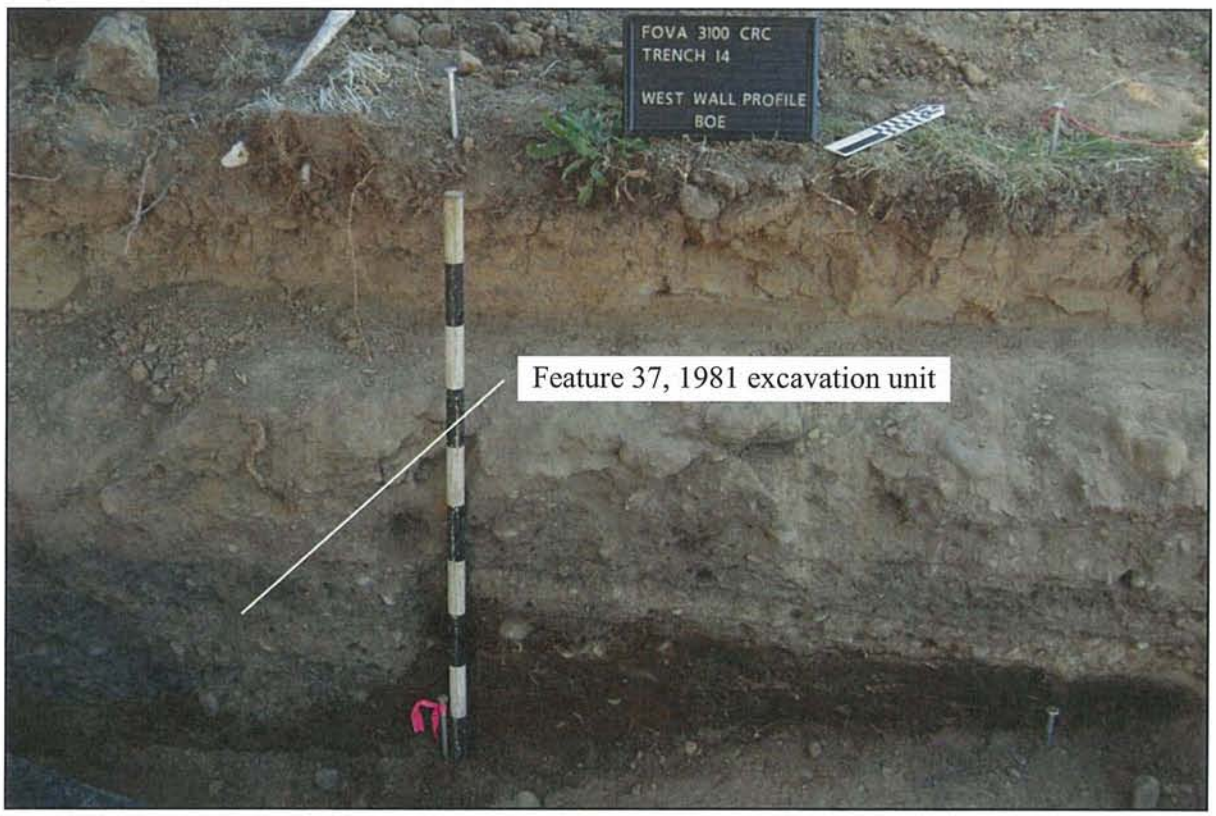

FIGURE 80. West wall of Trench 3-14 at 100 cm, showing a 1981 Kanaka House excavation unit, facing grid west. (NPS 09-13:1972, 6/3/09)

U.S. Army Southern Area Test Units

Data on the volume of sediments excavated and the number of artifacts recovered from the TUs in the southern portion of VNHR Area #3 are presented in Table 18.

TU3-01

TU3-01 was excavated within Trench 3-03, 50 cm grid east of the northwest corner, when a large quantity of 19th-century artifacts was observed during trenching. This material is presumably associated with the house of Joseph Tayentas, seen on the 1846 Covington map (Figure 53). Sediments observed consisted of three fill episodes below the topsoil: 17 cm of dark yellowish brown silt loam (redeposited B horizon?), over 26 cm of gray sand, over 30 cm of light gray sand. A buried A horizon extended from 84-96 cm, with the last few cm transitioning to B-horizon sediments. Artifacts collected consisted of a very high concentration of a combination of 19th- and 20th-century material, with wire nails and 19th-century domestic artifacts within the same stratum. This material may represent a sheet midden from Tayentas House, overlain and mixed with later debris from the railroad berm or U.S. Army. The unit was terminated at 125 cm.

TU3-02

TU3-02 was excavated within Trench 3-06, 280 cm grid east of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid north. Sediments observed consisted of four fill episodes below the topsoil: 20 cm of dark yellowish brown silt loam, over 16 cm of dark gray sand, over 18 cm of very dark gray sand, over 33 cm of dark gray sand with 60-70% machine-cut gravels at the bottom of the stratum. Gravels from the last fill episode were pushed into the top of a buried A horizon, which began at 94 cm. A very high number of mostly 19th-century artifacts were recovered from this layer.

An apparent piece of a wooden railroad tie, designated Feature 16A, was observed at 89 cm and extended to 112 cm (Figure 81). Directly beneath the railroad tie was a piece of flat wood, designated Feature 16B, which extended from 107 to 112 cm. The sandy fill around Features 16A and 16B contained an abundance of 19th-century domestic artifacts, with one railroad spike and a few pieces of wire and metal that may be associated with the railroad. Feature 17, a posthole, was recorded beneath Feature 16B. Feature 17 contained only wood and 19th-century artifacts, and was excavated to 207 cm, beyond which it became impracticable to excavate further. B-horizon sediments in the non-feature portion of the unit began at 112 cm, the unit levels were terminated at 136 cm.

TU3-03

TU3-03 was excavated within Trench 3-05, 240 cm grid east of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid east. Sediments observed consisted of five fill episodes below the topsoil: 24 cm of dark yellowish brown silt loam, over 36 cm of dark gray sand, over 9 cm of very dark gray sand, over 10 cm of gray sand, over 9 cm of brown sandy loam with 60-70% machine-cut gravels. Gravels from the last fill episode were pushed into the top of a buried A horizon, which began at 94 cm. A high number of exclusively 19th-century domestic artifacts were recovered from this layer. B-horizon sediments in the main part of TU3-03 were reached at 107 cm; the unit was terminated at 127 cm. Feature 18, a posthole with three large cobbles, was recorded in the southeast quadrant of the unit, and extended to a depth of 195 cm.

TABLE 18
EXCAVATION RESULTS FOR THE SOUTHERN PORTION OF VNHR AREA #3

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-01									
1	0-88	0.8750	-	-	-	-	-	-	-
2	88-89	0.0050	11	2200	2	1	3	-	-
3	89-99	0.0950	390	4105	102	62	147	60	13
4	99-103	0.0425	1	24	-	-	-	-	-
5	103-114	0.1050	36	343	-	-	-	-	-
6	114-124	0.1000	38	380	-	-	-	-	-
Total		1.2225	476	389	104	63	150	60	13
TU3-02									
1	0-105	0.8420	6	7	3	-	3	-	-
F16, L1	89-109	0.0400	-	-	-	-	-	-	-
2	105-113	0.0760	344	4526	105	54	120	6	9
F16, L2	109-113	0.0004	35	87500	-	2	13	2	3
3	113-117	0.0404	38	941	10	13	13	-	-
4	117-127	0.0950	-	-	-	-	-	-	-
F17, L1	122-123	0.0043	7	1629	2	-	2	-	-
5	127-138	0.0998	-	-	-	-	-	-	-
F17, L2	132-142	0.0043	7	1629	2	3	-	-	-
F17, L3	142-207	0.0279	24	859	2	6	9	-	1
Total		1.2300	461	375	124	78	160	8	13
TU3-03									
1	0-107	1.0675	-	-	-	-	-	-	-
2	107-112	0.0475	11	232	4	1	3	-	-
3	112-121	0.0925	246	2659	80	17	65	10	15
4	121-133	0.0920	1	11	-	-	-	-	-
5	133-142	0.0827	2	24	-	-	-	-	-
F18, L1	134-197	0.0001	5	96992	1	1	2	-	-
6	142-176	0.3440	-	-	-	-	-	-	-
Total		1.7262	265	154	85	19	70	10	15
TU3-04									
1	0-41	0.4100	-	-	-	-	-	-	-
2	41-47	0.0625	29	464	1	3	18	1	2
3	47-58	0.1125	1	9	-	-	-	-	-
4	58-69	0.1050	1	10	-	-	-	-	-
5	69-99	0.0750	62	827	-	-	-	-	-
Total		0.7650	93	122	1	3	18	1	2

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TABLE 18
EXCAVATION RESULTS FOR THE SOUTHERN PORTION OF VNHR AREA #3 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-05									
1	0-114	1.1400	-	-	-	-	-	-	-
2	114-118	0.0350	11	314	4	-	2	2	2
3	118-122	0.0425	11	259	-	1	4	1	-
4	122-133	0.1100	2	18	-	-	-	-	-
5	133-143	0.0975	2	21	-	-	-	-	-
Total		1.4250	26	18	4	1	6	3	2
TU3-06									
1	0-85	0.8450	-	-	-	-	-	-	-
2	85-90	0.0450	79	1756	13	6	52	3	-
3	90-100	0.0950	208	2189	51	11	120	12	7
4	100-109	0.0875	1	11	-	-	1	-	-
5	109-120	0.1025	-	-	-	-	-	-	-
6	120-128	0.0750	-	-	-	-	-	-	-
Total		1.2500	288	230	64	17	173	15	7
TU3-07									
1	0-83	0.8300	-	-	-	-	-	-	-
2	83-87	0.0425	87	2047	10	4	66	1	6
3	87-96	0.0900	741	8233	30	9	643	7	10
4	96-106	0.1025	8	78	-	-	8	-	-
5	106-113	0.0675	-	-	-	-	-	-	-
6	113-124	0.1025	-	-	-	-	-	-	-
Total		1.2350	836	677	40	13	717	8	16
TU3-08									
1	0-76	0.7575	-	-	-	-	-	-	-
2	76-79	0.0250	12	480	-	-	-	1	-
3	79-88	0.0900	472	5244	126	56	73	18	32
4	88-100	0.1150	233	2026	92	36	35	14	13
5	100-111	0.1050	3	29	-	-	-	-	-
6	111-122	0.1025	-	-	-	-	-	-	-
Total		1.1950	720	603	218	92	108	33	45

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TABLE 18
EXCAVATION RESULTS FOR THE SOUTHERN PORTION OF VNHR AREA #3 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m³)	Total Artifacts	Artifacts (/m³)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-09									
1	0-29	0.2925	-	-	-	-	-	-	-
2	29-33	0.0425	34	800	6	1	13	2	2
3	33-40	0.0650	21	323	5	1	4	1	7
4	40-54	0.1350	1	7	-	1	-	-	-
Total		0.5350	56	105	11	3	17	3	9
TU3-10									
1	0-46	0.4625	-	-	-	-	-	-	-
F19, L1	16-36	n/a	-	-	-	-	-	-	-
2	46-55	0.0925	-	-	-	-	-	-	-
3	55-65	0.0950	4	42	2	-	2	-	-
Total		0.6500	4	6	2	-	2	-	-
TU3-11									
1	0-30	0.3000	-	-	-	-	-	-	-
2	30-40	0.1000	6	60	3	-	2	1	-
3	40-49	0.0925	-	-	-	-	-	-	-
4	49-60	0.1075	-	-	-	-	-	-	-
Total		0.6000	6	10	3	-	2	1	-
TU3-12									
1	0-49	0.4875	-	-	-	-	-	-	-
2	49-54	0.0450	12	267	-	-	4	-	-
F21, L2	53-57	0.0100	-	-	-	-	-	-	--
3	54-57	0.0281	40	1422	2	-	1	-	-
F21, L3	57-58	0.0100	4	400	-	-	-	-	-
4	57-61	0.0281	18	640	8	1	5	1	1
F21, L4	61-64	0.0250	30	1200	5	11	7	1	1
5	61-71	0.0694	75	1081	27	2	13	6	8
6	71-77	0.0700	118	1686	9	7	3	26	12
7	77-89	0.0048	-	-	-	-	-	-	-
F25, L1	79-88	0.0864	261	3021	-	2	3	10	11
Total		0.8643	558	646	51	23	36	44	33

Continued on next page

TABLE 18
EXCAVATION RESULTS FOR THE SOUTHERN PORTION OF VNHR AREA #3 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU3-13									
1	0-54	0.5350	-	-	-	-	-	-	-
2	54-64	0.1025	64	624	1	12	-	-	1
3	64-71	0.0630	387	6143	17	171	144	43	1
F22, L1	64-72	0.0016	9	5625	-	6	1	-	-
F24, L1	67	n/a	2	-	-	-	-	-	-
Total		0.7021	462	658	18	189	145	43	2
TU3-14									
1	0-54	0.2836	-	-	-	-	-	-	-
2	54-64	0.0517	112	2167	-	4	2	-	1
3	64-72	0.0016	42	26250	3	7	9	2	2
F23, L1	66-73	0.0357	5	140	-	-	-	-	-
F26, L1	68	n/a	-	-	-	-	-	-	-
Total		0.3725	159	427	3	11	11	2	3
TU3-15									
1	0-42	0.1197	-	-	-	-	-	-	-
2	42-47	0.0143	14	982	-	-	1	-	-
3	47-51	0.0114	33	2895	3	-	-	-	-
F23, L1	51-64	0.0208	5	240	-	-	-	1	-
4	64-67	0.0038	2	533	1	1	-	-	-
5	67-77	0.0121	19	1572	1	5	7	5	-
Total		0.1820	73	401	5	6	8	6	-
TU3-16									
1	0-86	0.8600	-	-	-	-	-	-	-
2	86-95	0.0850	188	2212	41	25	81	7	1
3	95-99	0.0400	17	425	3	2	2	1	-
4	99-109	0.0950	30	316	1	2	10	2	2
5	109-119	0.1000	-	-	-	-	-	-	-
Total		1.1800	235	199	45	29	93	10	3
GRAND TOTAL		**15.1346**	**4718**	**312**	**778**	**547**	**1716**	**247**	**163**

*Personal and domestic items

FIGURE 81. TU3-02 at 112 cm, showing wood Feature 16 and posthole Feature 17, facing grid south. (NPS 09-10:11, 5/11/09)

TU3-04

TU3-04 was excavated within Trench 3-02, 290 cm grid south of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid northwest. Sediments observed consisted of three fill episodes below the topsoil: 8 cm of dark yellowish brown silt loam, over 6 cm of very dark brown sandy loam, over 24 cm of light gray silty sand. The A horizon in this unit was largely missing. The low numbers of 19th-century artifacts observed below the sandy fill were not from an intact stratum. B-horizon sediments appeared to begin at 55 cm but were disturbed; coal was present throughout. Several concrete curbing pieces were found to a depth of 117 cm where the unit was terminated.

TU3-05

TU3-05 was excavated within Trench 3-07, 320 cm grid east of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid northeast. Sediments consisted of six fill episodes below the topsoil (Figure 82): 20 cm of dark yellowish brown silt loam, over 10 cm of gray sand, over 17 cm of dark yellowish brown silt loam with 60% gravels, over 25 cm of very dark gray sand, over 26 cm of dark gray sand, over 7 cm of brown sandy loam with 60-70% machine-cut gravels. Gravels from the last fill episode were pushed into the top of a buried A horizon, which began at 118 cm. Cultural material consisted of a low density of 19th-century domestic artifacts, with one railroad spike recovered at the transition between the fill and the A horizon. B-horizon sediments were reached at 121 cm; the unit was terminated at 141 cm.

FIGURE 82. South wall of TU3-05 at 141 cm, showing the fill layers above intact sediments, facing grid south. (NPS 09-10:23, 5/14/09)

TU3-06 and TU3-07

These contiguous units were excavated within Trench 3-08, 380 cm (TU3-06) and 290 cm (TU3-07) grid south of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid west. Sediments observed consisted of three fill episodes below the topsoil: 20 cm of dark yellowish brown silt loam, over 45 cm of dark brown sandy loam, over 5 cm of grayish brown coarse sand. The buried A horizon began at 80 cm but was absent in the southern third of TU3-06. A very large quantity of 19th-century domestic artifacts were recovered from both units, including more than 800 pieces of vessel glass (mostly olive green). B-horizon sediments were reached at 90 cm; the unit was terminated at 122 cm.

TU3-08

TU3-08 was excavated within Trench 3-10, 39.9 m grid east of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House to grid east. The portion of the trench where this unit was located was also referred to as Trench 3-10 East because of a break of 180 cm between this area and the main part of Trench 3-10 to grid west. TU3-08 was located 475 cm grid east of the northwest corner of Trench 3-10 East. Archaeologically, deposits in this area are more congruent with the Servants house than with the main part of Trench 3-10.

Sediments observed consisted of three fill episodes below the topsoil: 10 cm of dark brown sandy loam, over 40 cm of dark gray sand, over 10 cm of brown sandy loam with 60-70% machine-cut gravels. Gravels from the last fill episode were pushed into the top of a buried A horizon, which began at 75 cm. A very large number of almost exclusively 19th-century domestic artifacts were recovered from this stratum. Feature 38, a diffuse soil stain that may have been a pit feature, was seen in the northeast quadrant of the unit and more clearly in the grid north wall profile. B-horizon sediments were reached at 99 cm; the unit was terminated at 119 cm.

TU3-09

TU3-09 was excavated within Trench 3-10, 17.3 m grid east of the northwest corner, to sample the distribution of cultural material in this portion of the project area between Tayentas House to grid east and Kanaka House to grid west. Sediments observed were not consistent throughout the unit. The north half of the unit had two fill episodes below the topsoil, consisting of 6 cm of dark yellowish brown silt loam, over 15 cm of dark brown silt loam with 15% gravels. No A horizon was present on the north half of the unit and few artifacts were present. The south half of the unit had only one fill layer, consisting of 17 cm of dark brown silt loam with 15% gravels. A small number of almost exclusively 19th-century artifacts came from buried A-horizon deposits reached at 24 cm on the south half on the unit. B-horizon sediments were reached at 31 cm (south) to 39 cm (north); the unit was terminated at 54 cm.

TU3-10

TU3-10 was excavated within Trench 3-10, 23 m grid east of the northwest corner, to investigate a probable road surface observed during trenching. This surface may correspond to the road seen on the 1859 Harney map through the 1878 Military Reserve map, extending from what is now East 5th Street south to the Columbia River. This road became McLoughlin Road in the 1880s. The road surface was observed below the topsoil and 7 cm of dark yellowish brown silt loam fill at 18-27 cm below surface. The compact gray macadam, designated Feature 19, was approximately 15-20 cm thick and difficult to dig through with the smooth backhoe bucket. The feature extended 4 m grid west of the unit and 6.3 m grid east of the unit, for a total width of 11.3 m within Trench 3-10. A few 19th-century artifacts were collected from beneath the roadbed. B-horizon sediments were reached at 37 cm; the unit was terminated at 60 cm.

TU3-11

TU3-11 was excavated within Trench 3-10, 9.75 m grid east of the northwest corner, to sample the distribution of cultural material in this portion of the project area between the Servants house to grid east and Kanaka House to grid west. Sediments observed were similar to those observed in TU3-09, consisting of two fill layers below the topsoil: 8 cm of dark grayish brown silt loam, over 12 cm of dark yellowish brown silt loam with 15% gravels. A thin discontinuous lens of buried A horizon was encountered at 25 cm. Sediments in this unit appear disturbed. A few artifacts, all 19th century, were recovered. B-horizon sediments were reached at 42 cm; the unit was terminated at 55 cm.

TU3-12

TU3-12 was excavated within Trench 3-12, 130 cm grid south of the northwest corner, to investigate a concentration of 19th-century artifacts observed while trenching. These artifacts may be associated with the nearby Kanaka House or another HBC Village structure. Sediments observed consisted of four fill episodes below the topsoil: 17 cm of yellowish brown silt loam, over 23 cm of grayish brown sand, over 4 cm of very dark grayish brown sand with 15-20% gravels, over 9 cm of dark brown silt loam. A buried A horizon was reached at 58 cm and contained a high density of mostly 19th-century domestic artifacts. Feature 21, a circular concrete post base presumed associated with U.S. Army activities, began at 49 cm in the northwest quadrant of the unit. Feature 21 cut into the 19th-century A-horizon sediments to a depth of 57 cm.

Sterile B-horizon sediments were reached at 66 cm in the southeast and southwest corners of the unit. At a depth of 79 cm, it was realized that an intrusive pit or hearth occupied the majority of the unit (and extended even farther beyond the boundaries of the unit). This pit was designated Feature 25 (Figure 83). The very dark grayish brown feature fill dipped into the center of the unit and contained an abundance of 19th-century artifacts, clay, charcoal, and fire-reddened earth. Feature 25 was excavated to a depth of 84 cm without reaching the bottom of the pit; the remainder of the feature was left intact for preservation or future investigation.

FIGURE 83. TU3-12 and Kanaka House pit Feature 25 at 84 cm, facing grid north. (NPS 09-13:1969, 6/3/09)

TU3-13, TU3-14, and TU3-15

These three contiguous units are associated with efforts to relocate the 1981Kanaka House excavations (Thomas and Hibbs 1984:312-324) and will be discussed together. The units were excavated on the grid east side of Trench 3-14; the grid west wall of all three units bordered on Trench 3-14. TU3-13 measured 1 x 1 m and began 6.6 m grid south of the northwest corner; TU3-14 measured 50 cm x 1 m and began 7.6 m grid south of the northwest corner; TU3-15 measured 50 x 50 cm and began 8.1 m grid south of the northwest corner.

Sediments observed consisted of five fill episodes below the topsoil (Figure 80): 17 cm of yellowish brown silt, over 24 cm of dark grayish brown sandy loam with 30-40% cobbly gravels, over 10 cm of very dark grayish brown silt loam with 30-40% fine gravels, over 5 cm of dark grayish brown silt loam with 30-40% fine gravels, over 6 cm of dark yellowish brown silt loam with 30-40% fine gravels. The buried A horizon began at 60 cm and contained a very large number of exclusively 19th-century domestic artifacts.

Five features were recorded (Figure 84). Feature 22 was a vertical wood post or footing in the northeast corner of TU3-13, associated with fragments of flat glass and a square nail. Feature 24 was an area of charcoal, glass, and nails in the northwest corner of TU3-13. Between these two areas was a concentration of flat glass and olive vessel glass (no feature number). These areas were outside the 1981 excavation block.

Feature 26 was recorded in the south central portion of the TU3-13 and extended into TU3-14. This feature corresponds to the Thomas and Hibbs (1984:318) Feature 71, which was described as a HBC wooden footing 2.2 ft. long by .85 ft. wide associated with artifacts, fire-altered soils, and charcoal. When the footing was removed in 1981, a metal-rimmed paper artifact tag was placed at the bottom of the feature to mark its location (Lee Stilson, personal communication, July 27, 2009). This tag was recovered in TU3-13 within Feature 26. A fire-reddened cobble located at the southeast corner of this feature area may be the same one mapped and photographed in this location in 1981.

Feature 36, an area of contrasting soils, was recorded in the southwest corner of TU3-13 and extended into TU3-14 and TU3-15. Subsequent research revealed that Feature 36 corresponds to an 8 in. baulk left west of Thomas and Hibbs (1984:318) Feature 71 in 1981.

Feature 23, located grid west of Feature 36 in TU3-14 and TU3-15, corresponds to Thomas and Hibbs (1984:318) Feature 66, described as a large irregular pit containing sand, charcoal flecks, fire-altered clay, and many 19th-century artifacts. The authors speculated that the portion of the pit seen in TU3-14 and TU3-15 may have served as a trench for structural posts (Thomas and Hibbs 1984:317).

The units and features were excavated only until enough of the archaeological deposits were exposed to accurately determine their location within the 1981 excavation block. Hand excavations were terminated at 69-73 cm without reaching sterile sediments. The remainder was left intact for preservation or future investigation.

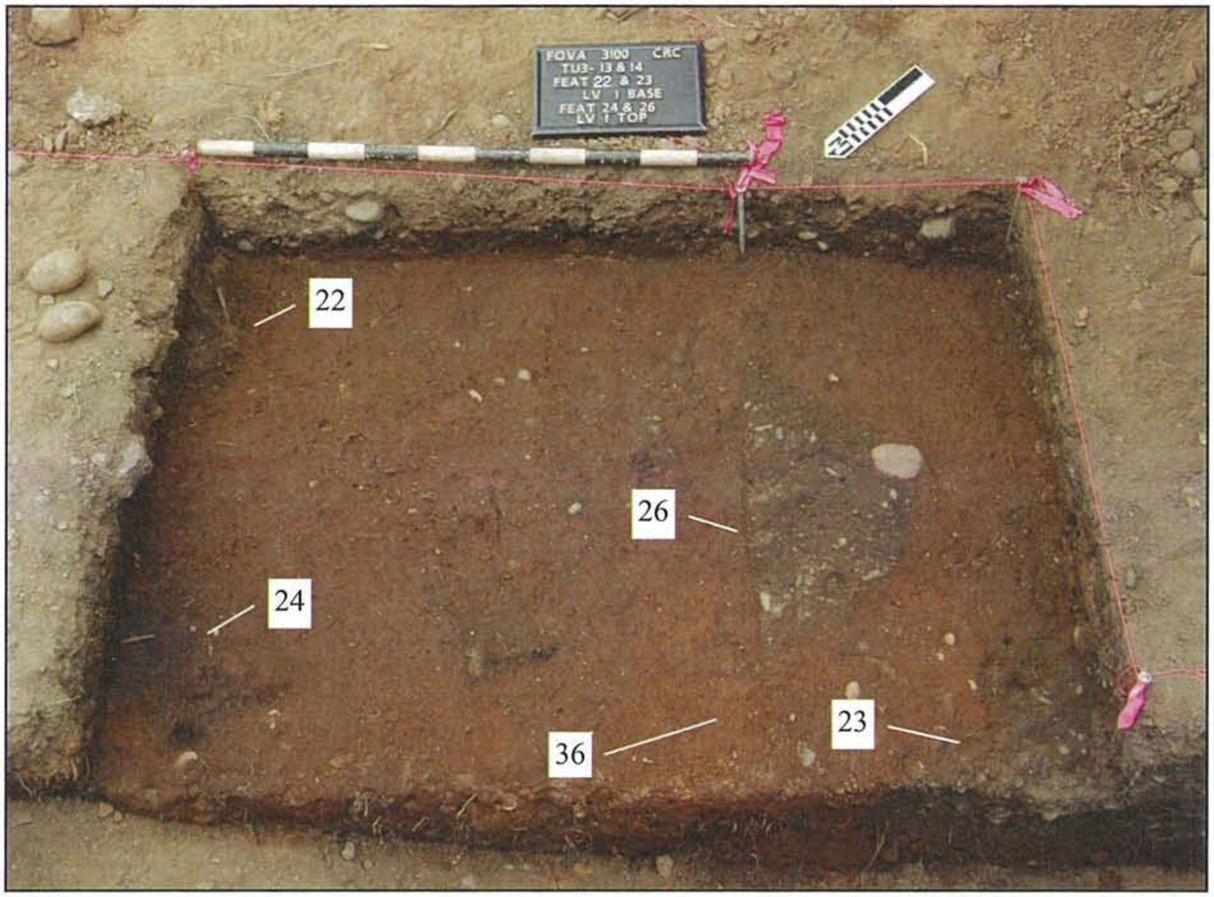

FIGURE 84. TU3-13 (left) and TU3-14 (right) at 69 cm, showing Kanaka House Features 22, 23, 24, 26, and 36, facing grid east. (NPS 09-13:1963, 6/2/09)

At the end of testing, Trench 3-14 was widened to more accurately map the 1981 Kanaka House excavation block by exposing the block's western corners. Fill sediments were stripped only as far as necessary to reveal the tops of the corners of the block, and the western portion of the north, south, and west boundary lines. Trench 3-16 was excavated along the south edge of the 1981 excavation block to expose a larger portion of that boundary line. The eastern corners of the block were extrapolated by measuring with compass and tape, because the northeast corner is underneath an adjacent paved parking lot, and the southeast unit was not excavated.

<u>TU3-16</u>

TU3-16 was excavated on the grid west side of Trench 3-08, 8.4 m grid south of the northwest corner, to investigate the extent of 19th-century cultural material associated with Tayentas House located grid north. This unit is south of TU3-06 and TU3-07, which were excavated within Trench 3-08. Sediments observed consisted of three fill layers below the topsoil: 16 cm of dark yellowish brown silt, over 19 cm of dark grayish brown sandy loam, over 32 cm of gray sand. The buried A horizon began at 80 cm and contained a large quantity of almost exclusively 19th-century domestic artifacts. B-horizon sediments were reached at 92 cm; the unit was terminated at 120 cm.

ANALYSIS RESULTS

Through the review of historical documents and maps, previous archaeological studies, the Fort Vancouver National Historic Site GIS database, and the results of geophysical surveys and archaeological field investigations, six cultural resources were identified in U.S. Army VNHR Area #3 within the CRC APE: 1892 U.S. Army Stable, 1859 Quartermaster's Stable, 1850s McLoughlin Road, 1880s McLoughlin Road Tree Allée, 1840s Kanaka House, and 1840s Tayentas House. No other significant resources were located, although undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to 19th-century structures, may still exist below fill layers on U.S. Army property within the CRC APE.

U.S. Army Northern Area

1892 U.S. Army Stable

Archaeological deposits and features from the 1892 U.S. Army Stable, located on the south side of East 5th Street, were encountered in TU3-22 and Trench 3-39 in the northern portion of VNHR Area #3. Two features were recorded in these units. Feature 34, a brick wall, was found on the north side of Trench 3-39 running parallel to East 5th Street (Figure 85, see also Figure 66). Feature 35, a previous excavation unit from OP52B (Thomas and Hibbs 1984:405-410), was observed in the eastern 20 cm of TU3-22 (Figure 86). The western 80 cm of TU3-22 was undisturbed, and yielded a large assemblage of late 19th- and early 20th-century artifacts.

The cultural material associated with these excavation units consists predominantly of 19th-century artifacts. A typological classification of these objects is presented in Table 19. Probable modern artifacts that are not included in Table 19 include aluminum, concrete, and a piece of rubber. These items largely constitute the difference seen between the total artifacts recovered from the U.S. Army Stable TU in the volumetrics table (Table 16), and the number of artifacts from these units in the typology table.

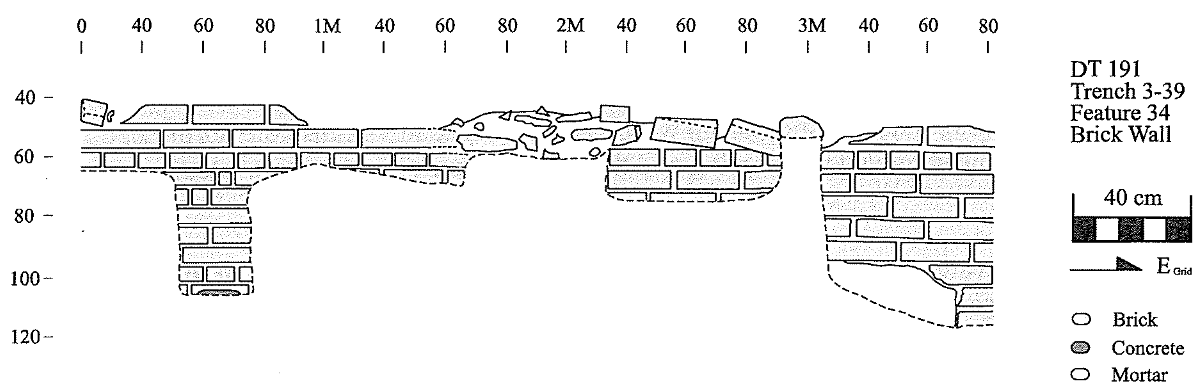

FIGURE 85 Feature 34, a brick wall associated with the U.S. Army Stable, in the north wall of Trench 3-39 on the south side of East 5th Street. (NPS 2010)

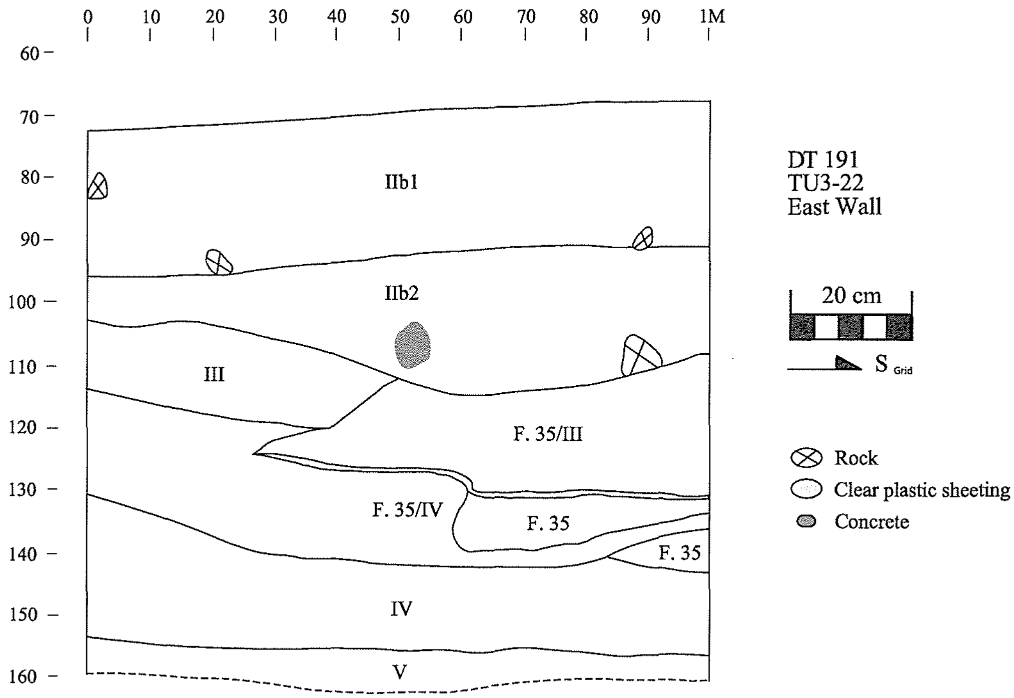

FIGURE 86. East wall profile of TU3-22, showing Feature 35, the Thomas and Hibbs (1984) OP52B excavation unit. (NPS 2010)

More than 58% (n=386) of the artifact assemblage in Table 19 consists of architectural material, primarily flat glass (22%, n=145), all varieties of square nails (17%, n=112), and brick and mortar (11.9%, n=78). There are moderate numbers of personal (8.8%, n=58) and domestic (8.1%, n=53) items. The majority of personal items recovered are from alcohol and liquor bottles (7%, n=46) (Figure 87), and tobacco pipes (1.5%, n=10) (Figure 88). The items recovered whose function could not be determined (24.5%, n=161) consist mainly of bottle glass and glass sherds.

The mean dates for ceramic sherds recovered at the U.S. Army Stable (n=23) show that the majority of these artifacts date from ca. 1845, with a second peak at ca. 1875 (Figure 89). Ceramic types with a mean date of ca. 1845 include stoneware (n=7), white earthenware (n=5), ironstone (n=3), and English porcelain (n=1). A Gothic ironstone sherd (n=1) has a mean ceramic date of 1855. Six ironstone sherds have a mean ceramic date of ca. 1875. These date ranges are consistent with the HBC and Early U.S. Army occupation periods at Fort Vancouver, but suggest a date earlier than 1892 for the U.S. Army Stable artifact assemblage.

The thickness of window glass fragments at the U.S. Army Stable (n=145) has a primary mode of 0.065 in. (n=42), which corresponds to a date range of 1845-1855 (Figure 90). Significant numbers of glass fragments with modes of 0.055 in. (pre-1845), 0.075 in. (1850-1865), and 0.085 in. (1855-1885) also date from before the construction of this building. These numbers suggest the presence of an earlier building at this location, or perhaps the reuse of window glass in this building from older structures.

TABLE 19
CHARACTERISTICS OF ARTIFACTS AT THE 1892 U.S. ARMY STABLE

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Button, 4-Holed	I.A	1	0.15
Bead, Drawn	I.C	1	0.15
Bottle, Alcohol	I.G	43	6.53
Bottle, Liquor	I.G	3	0.46
Pipe, Tobacco	I.G	10	1.52
Total		**58**	**8.8%**
Domestic Items			
Bone, Butchered	II.B.2	2	0.30
Bone, Unworked	II.B.2	22	3.34
Bottle, Food	II.B.2	1	0.15
Earthenware	II.B.2	5	0.76
Glassware Sherd	II.B.2	1	0.15
Ironstone	II.B.2	10	1.52
Porcelain	II.B.2	1	0.15
Metal Spoon Fragments	II.B.2	4	0.61
Stoneware	II.B.2	7	1.06
Total		**53**	**8.1%**
Architecture			
Brick	III.B.1	39	5.93
Brick and Mortar	III.B.1	24	3.65
Flat Glass	III.B.1	145	22.04
Mortar	III.B.1	15	2.28
Roofing Tile Fabric	III.B.2	3	0.46
Wood Fragments	III.B.1	11	1.67
Wood, Unworked	III.B.1	4	0.61
Charcoal	III.B	1	0.15
Wire	III.B.2	3	0.46
Nail, Machine-Cut	III.B.2	32	4.86
Nail, Machine-Cut American	III.B.2	2	0.30
Nail, Square	III.B.2	69	10.49
Nail, Unidentified	III.B.2	6	0.91
Nail, Wire	III.B.2	11	1.67
Nail, Wrought	III.B.2	3	0.46
Nut	III.B.2	1	0.15
Screw	III.B.2	2	0.30
Coal	III.E	15	2.28
Total		**386**	**58.7%**

Continued on next page

TABLE 19
CHARACTERISTICS OF ARTIFACTS AT THE 1892 U.S. ARMY STABLE (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Unknown			
Bisque	VIII	1	0.15
Copper Fragment	VIII.A	1	0.15
Unidentified Metal Artifact	VIII.A	2	0.30
Metal Bar	VIII.A	1	0.15
Metal Fragment	VIII.A	12	1.82
Metal Ring	VIII.A	1	0.15
Bottle Glass	VIII.B	99	15.05
Glass Sherd	VIII.B	44	6.69
Total		**161**	**24.5%**
GRAND TOTAL		**658**	

FIGURE 87. "Pumpkin seed" alcohol flask from the 1892 U.S. Army Stable area in VNHR Area #3. (NPS 09-17:1254, 12/15/09)

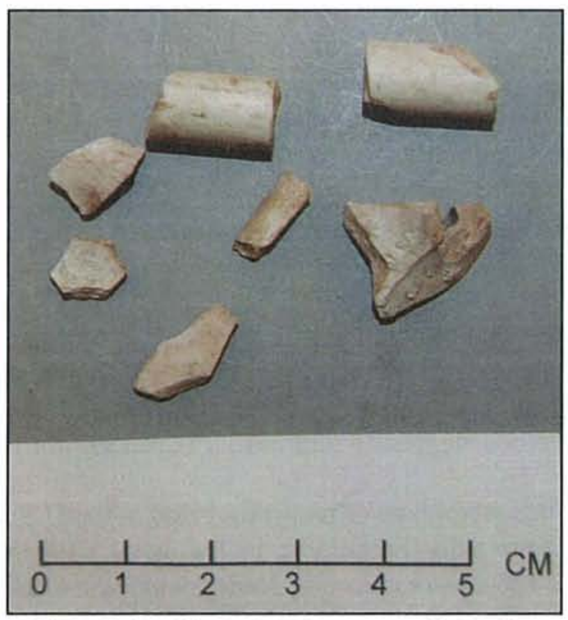

FIGURE 88. Clay pipe fragments from the 1892 U.S. Army Stable area in VNHR Area #3. (NPS 09-17:2274, 12/15/09)

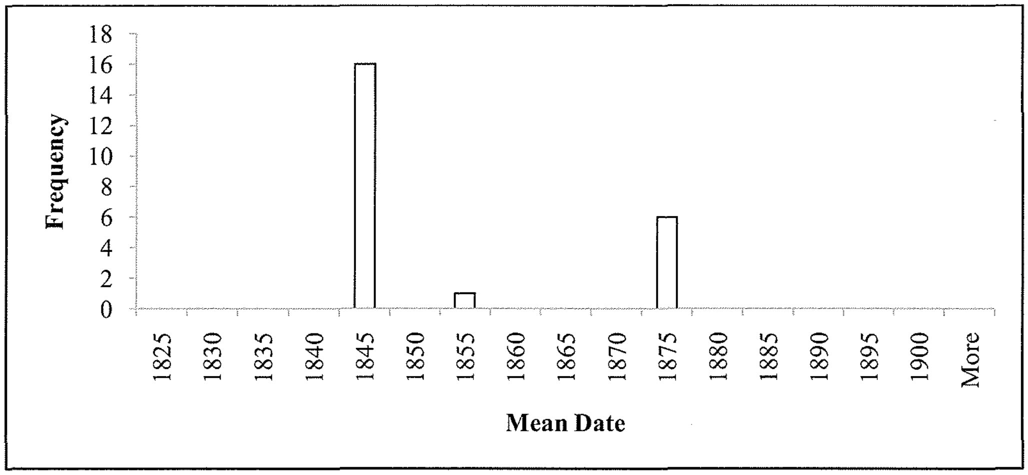

FIGURE 89. Mean ceramic dates at the U.S. Army Stable (σ=13.6). (NPS 2010)

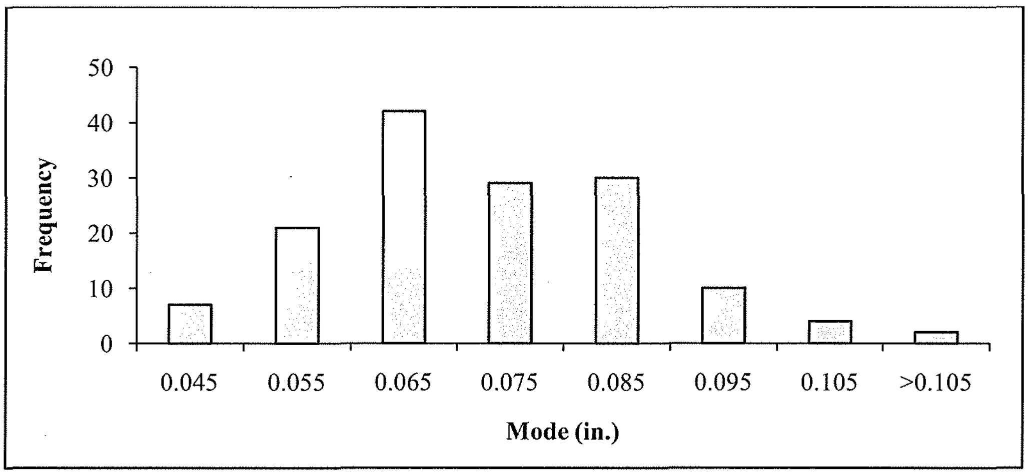

FIGURE 90. Window glass thickness at the U.S. Army Stable. (NPS 2010)

The date of manufacture for vessel glass fragments (n=191) at the U.S. Army Stable is largely unknown (n=151); however, 21% of fragments (n=40) are from free blown and blown-into-mold vessels. The relatively large proportion of vessels represented by this pre-1900 manufacturing method suggests a date earlier than 1892 for the U.S. Army Stable artifact assemblage.

The assemblage of nails recovered at the U.S. Army Stable (n=123) is biased heavily toward square nails (Figure 91). Including the nails that were collected as grab samples from Trench 3-33 (38 square nails and 3 wire nails), the total number of all varieties of square nails (n=112) heavily outweighs the number of wire nails (n=11).

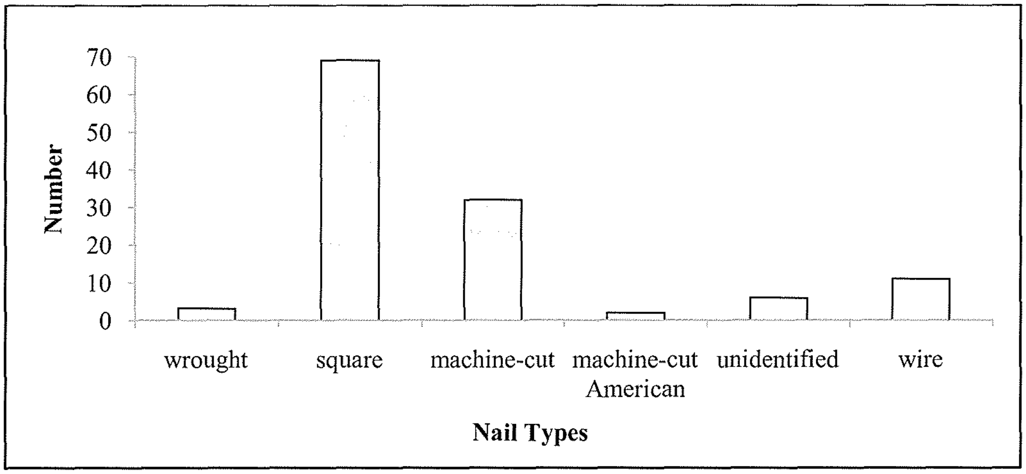

FIGURE 91. Nail types at the U.S. Army Stable. (NPS 2010)

Of the total number of temporally diagnostic artifacts recovered at the U.S. Army Stable excavation units, there are more artifacts attributable to the 19th century (94.9%, n=314) than to the 20th century (5.1%, n=17) (Figure 92). This date range is consistent with the 1892 construction date for the building. The majority of artifacts recovered appear to represent architectural debris related to an historical structure.

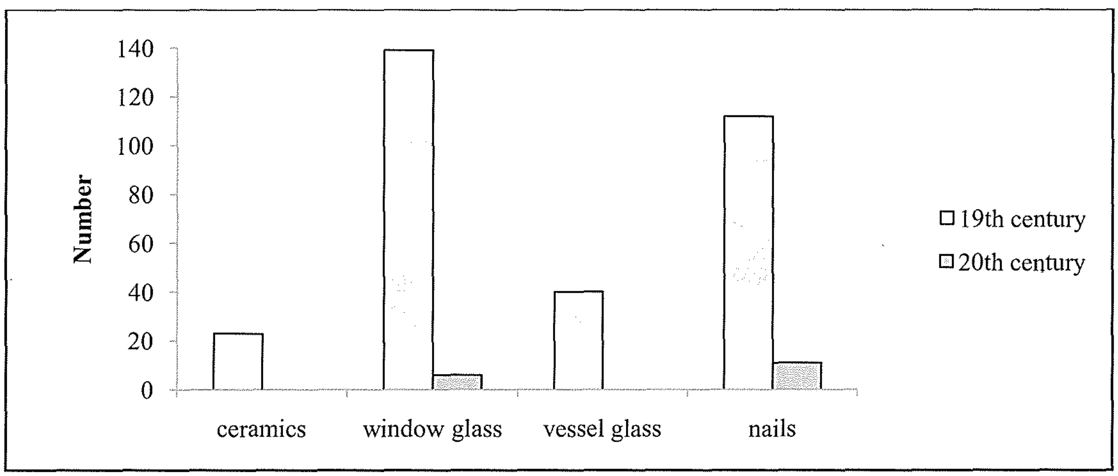

FIGURE 92. Distribution of temporally diagnostic artifacts at the U.S. Army Stable. (NPS 2010)

The location of earlier buildings projected in GIS from historical maps shows that there were several workshop and utility buildings dating from 1850 present just east of the 1892 U.S. Army Stable. Although the brick wall Feature 34 may be from the 1892 U.S. Army Stable, the artifact data from the ceramics, window glass, vessel glass, and nails suggest that an earlier structure may also have been present at this location.

1859 Quartermaster's Stable

Archaeological deposits and features from the 1859 Quartermaster's Stable, located northwest of Building 400, were encountered in TU3-19 and TU3-20, and in Trench 3-32 and Trench 3-33, in the northern portion of VNHR Area #3. Five features associated with the Quartermaster's Stable Building were found in TU3-19 and TU3-20. Feature 27, two brick foundation piers, and Features 30 and 32, wood structural elements, were found in the location of TU3-19 (Figure 93, see also Figures 67-68). Feature 29, a brick foundation pier, and Feature 31, wood structural elements, were found in the location of TU3-20.

The cultural material associated with these excavation units consists of a mix of 19th- and 20th-century artifacts. A typological classification of these objects is presented in Table 20. Probable modern artifacts that are not included in Table 20 include asphalt, concrete, tar, and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the Quartermaster's Stable TUs in the volumetrics table (Table 16), and the number of artifacts from these units in the typology table.

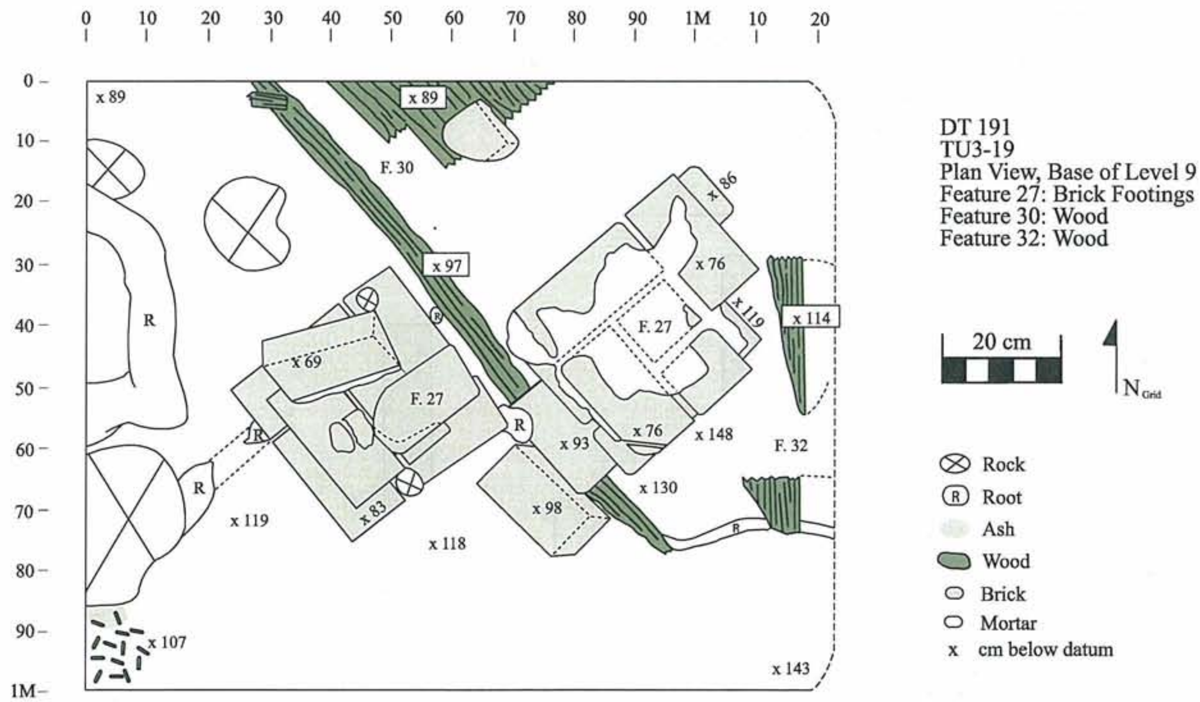

FIGURE 93. Base of Unit Level 9, TU3-19, showing the Quartermaster's Stable brick foundation piers and structural remains. (NPS 2010)

More than 92% (n=1189) of artifact assemblage in Table 20 consists of architectural material, primarily wire nails (29.3%, n=378), brick (16.6%, n=214), mortar (8.4%, n=108), and all varieties of square nails (5.5%, n=71). There are few personal (1.2%, n=15) and domestic (1.2%, n=15) items. The items recovered whose function could not be determined (5.2%, n=67) consist mainly of glass sherds, metal fragments, and bottle glass.

TABLE 20
CHARACTERISTICS OF ARTIFACTS AT THE 1859 QUARTERMASTER'S STABLE

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Bottle, Alcohol	I.G	6	0.47
Bottle, Beer	I.G	7	0.54
Pipe, Tobacco	I.G	2	0.16
Total		**15**	**1.2%**
Domestic Items			
Earthenware	II.B.2	3	0.23
Earthenware, Transferprinted	II.B.2	1	0.08
Glassware Sherd	II.B.2	6	0.47
Ironstone	II.B.2	2	0.16
Porcelain	II.B.2	1	0.08
Stoneware	II.B.2	1	0.08
Lamp Glass	II.B.3	1	0.08
Total		**15**	**1.2%**
Architecture			
Brick	III.B.1	214	16.59
Brick, American	III.B.1	1	0.08
Flat Glass	III.B.1	14	1.09
Mortar	III.B.1	108	8.37
Wood Fragment	III.B.1	33	2.56
Wood, Unworked	III.B.1	2	0.16
Wood, Worked	III.B.1	2	0.16
Shingle	III.B.1	1	0.08
Slate	III.B.1	17	1.32
Tar	III.B.1	27	2.09
Charcoal/Wood	III.B.1	25	1.94
Metal Wire	III.B.2	53	4.11
Nail, Machine-Cut	III.B.2	3	0.23
Nail, Machine-Cut American	III.B.2	1	0.08
Nail, Square	III.B.2	66	5.12
Nail, Wire	III.B.2	378	29.30
Nail, Wrought	III.B.2	1	0.08
Washer	III.B.2	1	0.08
Metal Staple	III.B.2	1	0.08
Coal	III.E	241	18.68
Total		**1189**	**92.2%**
Commerce and Industry			
Coin	V	1	0.08
Bullet	V.B or VI.B.	1	0.08
Bottle, Medicine	V.J.6.b	2	0.16
Total		**4**	**0.3%**

Continued on next page

TABLE 20
CHARACTERISTICS OF ARTIFACTS AT THE 1859 QUARTERMASTER'S STABLE (CONT.)

OBJECT	Sprague (1981) Typology	Number	Percent
Unknown			
Unidentified Composite Artifact	VIII	1	0.08
Copper Wire	VIII.A	2	0.16
Unidentified Metal Artifact	VIII.A	1	0.08
Metal Clasp	VIII.A	1	0.08
Metal Fragment	VIII.A	18	1.40
Bottle Glass	VIII.B	14	1.09
Glass Sherd	VIII.B	30	2.33
Total		**67**	**5.2%**
GRAND TOTAL		**1290**	

The mean dates for the few ceramic sherds recovered at the Quartermaster's Stable (n=8) show that the majority of these artifacts date from ca. 1845 (Figure 94). Ceramic types with a mean date of ca. 1845 include white earthenware (n=3), and one each of transferprinted earthenware, stoneware, and English porcelain. Two ironstone sherds have a mean ceramic date of ca. 1875. These date ranges are consistent with the HBC and Early U.S. Army periods at Fort Vancouver.

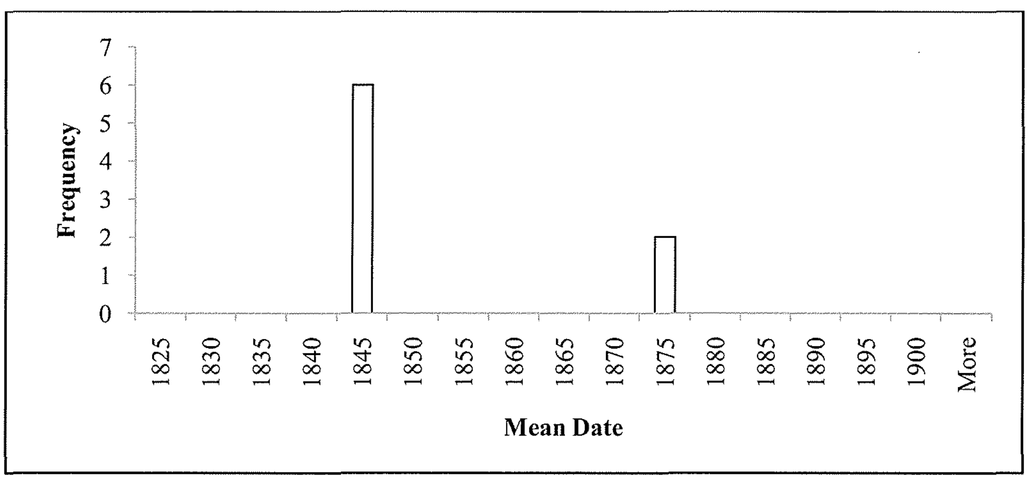

FIGURE 94. Mean ceramic dates at the Quartermaster's Stable (σ=14.1). (NPS 2010)

9558

There is no clear mode for the thickness of the few fragments of window glass (n=14) recovered at the Quartermaster's Stable (Figure 95). Historical reports maintain that the building was under constant repair, rebuilding, and expansion into the early 20th century, so the glass thickness data may reflect these multiple construction episodes.

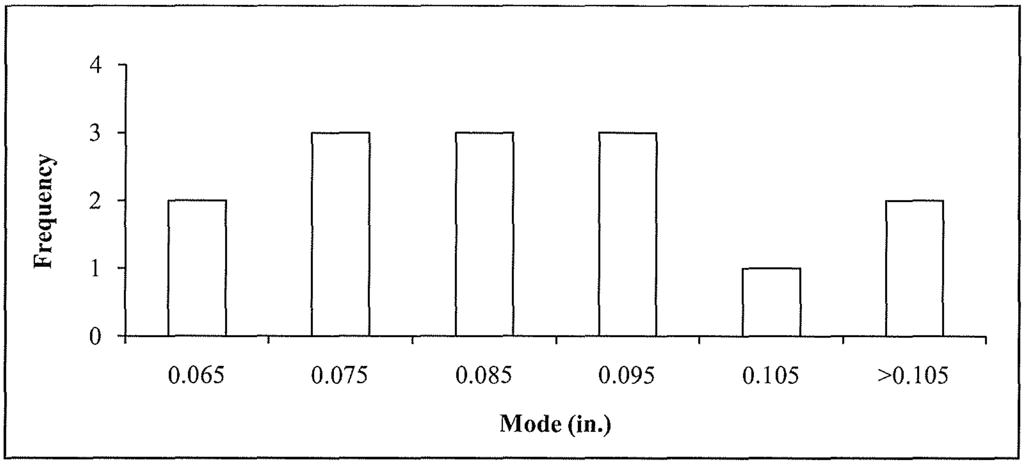

FIGURE 95. Window glass thickness at the Quartermaster's Stable. (NPS 2010)

With the exception of one blown-into-mold and three machine made vessel glass fragments, no temporally diagnostic attributes are present on the vessel glass fragments (n=66) from the Quartermaster's Stable.

The assemblage of nails recovered at the Quartermaster's Stable (n=449) is strongly biased toward wire nails (Figure 96). The total number of wire nails (n=378) heavily outweighs the total number of all varieties of square nails (n=71). This again may be a reflection of the multiple construction episodes that this building underwent into the early 20th century.

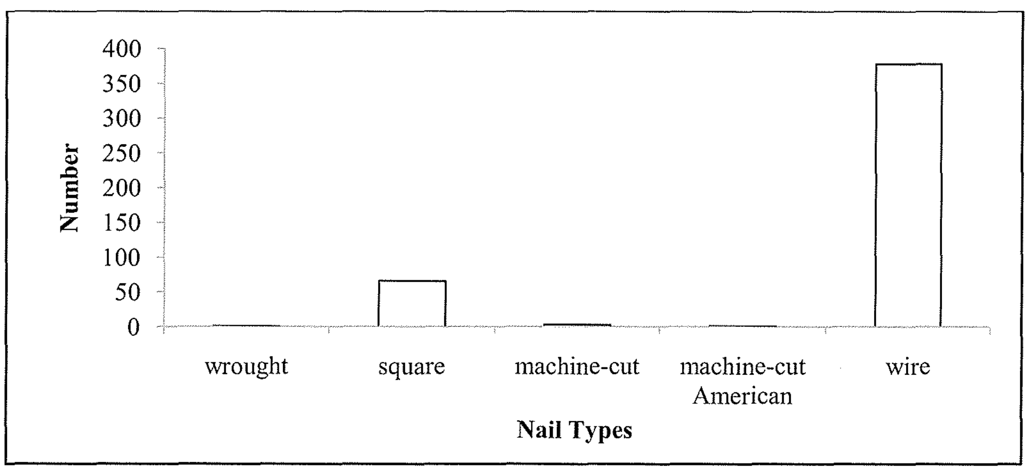

FIGURE 96. Nail types at the Quartermaster's Stable. (NPS 2010)

Of the total number of temporally diagnostic artifacts recovered from the 1859 Quartermaster's Stables TUs, there are more artifacts attributable to the 20th century (94.3%, n=384) than to the 19th century (5.7%, n=23) (Figure 97). The large number of wire nails accounts for the majority of the 20th-century artifacts (92.9%). Their presence is likely tied to 20th-century repair and renovation episodes. The lack of window glass, personal items, and domestic artifacts is consistent with what might be expected at a mid-1800s stable. The majority of artifacts recovered from the 1859 Quartermaster's Stable appear to represent architectural debris related to this historical structure.

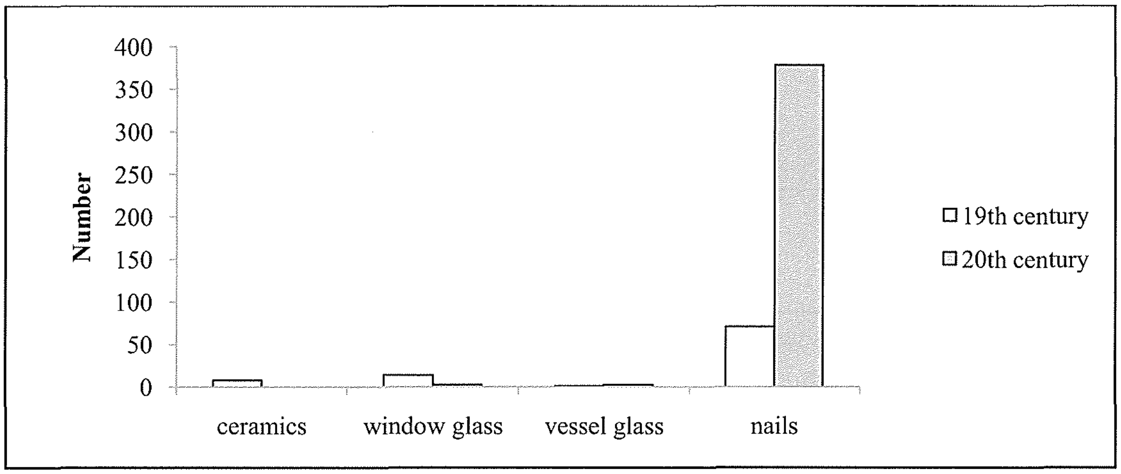

FIGURE 97. Distribution of temporally diagnostic artifacts at the Quartermaster's Stable. (NPS 2010)

TU3-19 and TU3-20 were undoubtedly located within the footprint of the 1859 Quartermaster's Stable. The artifacts recovered represent the architectural remains of a large stable building and a small scatter of associated debris that might be found around the building before its demolition. The brick footing Features 27 and 29, and the wood structural element Features 30, 31, and 32, are remains of the foundation and flooring of the 1859 Quartermaster's Stable building.

U.S. Army Southern Area

1850 McLoughlin Road

The 1850s McLoughlin Road, extant in the northern portion of VNHR Area #3, was located archaeologically in the southern portion of VNHR Area #3 in TU3-10 and Trench 3-10. The road surface, identified as Feature 19 (Figure 98), consists of a compact macadam approximately 11.3 m wide, passing between two heritage oak trees within the allée that was planted in the 1880s. The route of McLoughlin Road was a primary north/south route through the HBC Village from the waterfront to Upper Mill Road (now East 5th Street) and the Catholic Mission site ca. 1827-1849. It was established at least by the 1850s and first seen on the 1854 Bonneville map. Four artifacts were recovered from these units.

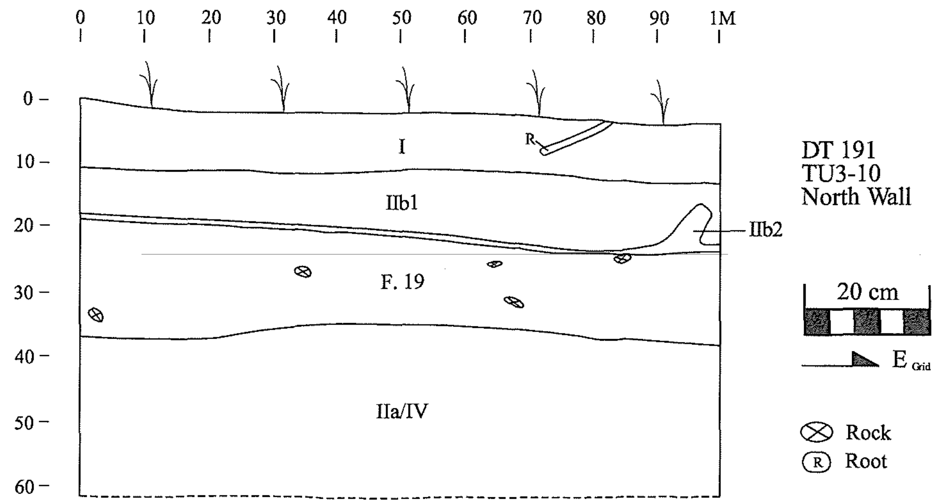

FIGURE 98. North wall profile of TU3-10 showing McLoughlin Road. (NPS 2010)

1880s McLoughlin Road Tree Allée

The 1880s McLoughlin Road Tree Allée is a landscape feature of the Vancouver National Historic Reserve that is extant throughout VNHR Area #3 (Figures 69-70 and 75-77). No excavations were conducted near these trees, and no artifacts were observed that might be associated with the trees or the allée.

1840s Kanaka House

Archaeological deposits and features from the 1840s Kanaka House, located just south of a paved parking area inside a gated security area, were encountered in TU3-12, TU3-13, TU3-14, TU3-15; and in Trench 3-11, Trench 3-12, Trench 3-14, and Trench 3-16, in the southern portion of VNHR Area #3.

Five features associated with Kanaka House were found in TU3-13, TU3-14, and TU3-15. Feature 22 is a vertically oriented wood footing or post, Feature 23 is Thomas and Hibbs (1984:318) Feature 66 pit, Feature 24 is a burned surface with 19th-century artifacts, Feature 26 is Thomas and Hibbs (1984:318) Feature 71 footing, and Feature 36 is Thomas and Hibbs (1984:318) excavation baulk (Figure 99, see also Figure 84).

In TU3-12, Feature 25, a pit associated with abundant 19th-century artifacts (Figure 100, see also Figure 83), is located approximately 5 m from the 1981 Thomas and Hibbs 1984:312-324) Kanaka House excavation block. Although the purpose of the pit has not yet been established (it was not fully excavated), its proximity to Kanaka House suggests that it is part of the living surface associated with the house.

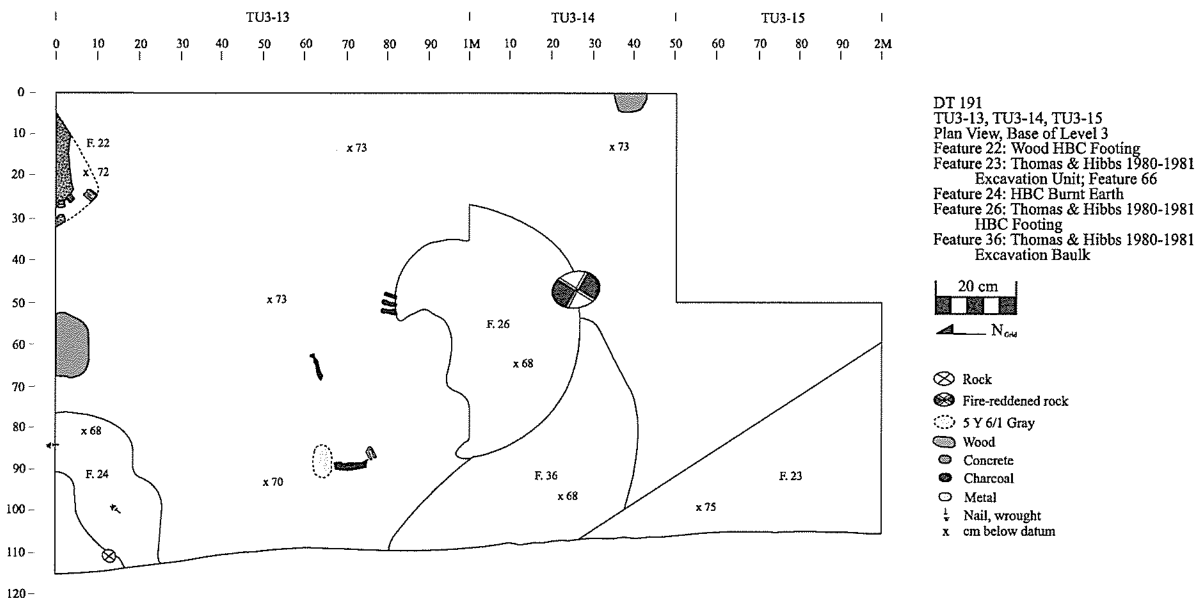

FIGURE 99. TU3-13, TU3-14, and TU3-15 at the base of excavations, showing Kanaka House features. (NPS 2010)

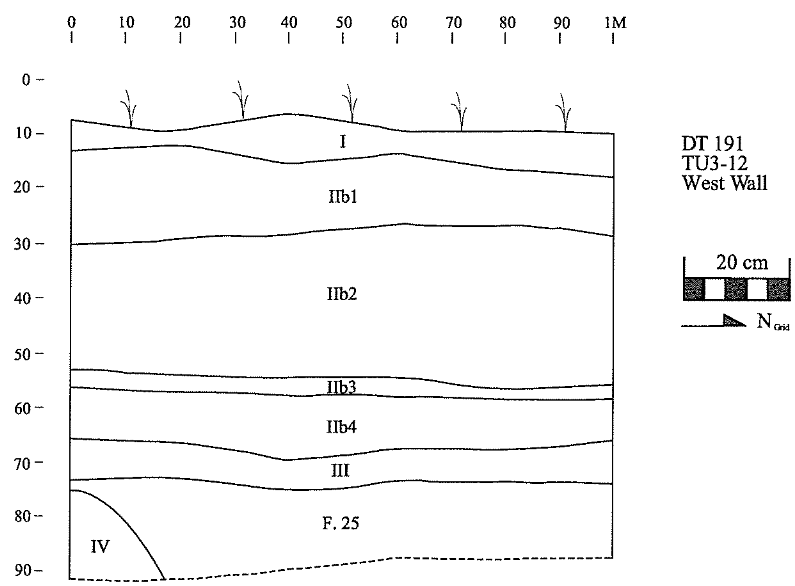

FIGURE 100. West wall profile of TU3-12 showing pit Feature 25. (NPS 2010)

The cultural material associated with these excavation units consists predominantly of 19th-century artifacts. A typological classification of these objects is presented in Table 21. Probable modern artifacts that are not included in Table 21 include asphalt, concrete, foil, plastic, and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the Kanaka House TUs in the volumetrics table (Table 18), and the number of artifacts from these units in the typology table.

TABLE 21
CHARACTERISTICS OF ARTIFACTS AT THE 1840s KANAKA HOUSE

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Grommet	I.A	1	0.09
Textile Fabric	I.A	1	0.09
Bead, Drawn	I.C	5	0.43
Bottle, Alcohol	I.G	108	9.33
Pipe, Tobacco	I.G	29	2.51
Total		**144**	**12.4%**
Domestic Items			
Bone, Unworked	II.B.2	172	14.87
Earthenware	II.B.2	34	2.94
Earthenware, Transferprinted	II.B.2	30	2.59
Glassware Sherd	II.B.2	1	0.09
Ironstone	II.B.2	10	0.83
Porcelain	II.B.2	3	0.26
Total		**250**	**21.6%**
Architecture			
Brick	III.B.1	55	4.75
Coral	III.B.1	7	0.61
Concrete Post	III.B.1	4	0.35
Flat Glass	III.B.1	229	19.79
Wood, Burned	III.B.1	4	0.35
Wood, Unworked	III.B.1	2	0.17
Nail, Square	III.B.2	86	7.43
Nail, Wrought	III.B.2	9	0.78
Clinker	III.E	5	0.43
Coal	III	159	13.74
Slag	III.E	4	0.35
Total		**564**	**48.7%**
Commerce and Industry			
Gunflint	V.B	1	0.09
Bottle, Medicine	V.J.6.b	2	0.17
Total		**3**	**0.3%**
Group Services			
Button, Military	VI.B.4	**1**	**0.1%**
Unknown			
Artifact Tag with String	VIII	1	0.09
Bisque	VIII	85	7.35
Fired Clay	VIII	1	0.09

Continued on next page

TABLE 21
CHARACTERISTICS OF ARTIFACTS AT THE 1840s KANAKA HOUSE (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Unknown (cont.)			
Rubber Insulation/Conduit	VIII	1	0.09
Slate	VIII	1	0.09
Lead Washer	VIII.A	3	0.26
Unidentified Metal Artifact	VIII.A	1	0.09
Metal Fragment	VIII.A	17	1.47
Bottle Glass	VIII.B	28	2.42
Glass Sherd	VIII.B	61	5.27
Total		**199**	**17.2%**
GRAND TOTAL		**1161**	

More than 48% (n=564) of the artifact assemblage in Table 21 consists of architectural material, primarily flat glass (19.8%, n=229), square and wrought nails (8.2%, n=95), and brick (4.8%, n=55). Seven pieces of coral are listed under architectural material (Figure 101). Although coral has been found as a component of mortar at Fort Vancouver, native Hawaiians also used coral as a cosmetic to stiffen their hair (Forbes 1992:69). Domestic items constitute over 21% of the assemblage (n=250), dominated by unworked bone (14.9%, n=172), and ceramics (6.6%, n=77). The majority of personal items recovered (12.4%, n=144) are from alcohol bottles (9.3%, n=108) and tobacco pipes (2.5%, n=29). Figure 102 shows the beads recovered from Kanaka House (n=9, including grab sample) and Tayentas House (n=7). One Phoenix military button (Figure 103) and one English gunflint (Figure 104, shown with a gunflint from Tayentas House) were found. The items recovered whose function could not be determined (17.2%, n=199) consist mainly of bisque, glass sherds, bottle glass, and metal fragments.

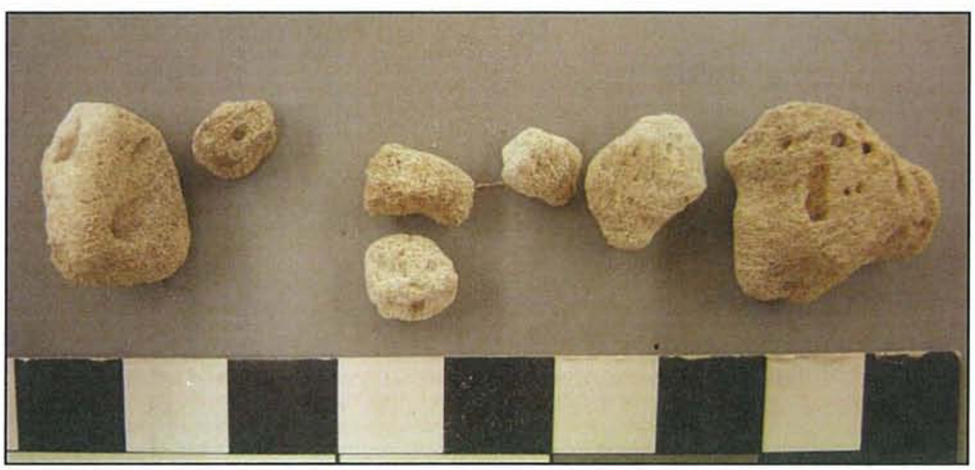

FIGURE 101. Coral from TU3-12 at Kanaka House in VNHR Area #3. (NPS 09-17:1163, 12/14/09)

FIGURE 102. Beads from Kanaka House and Tayentas House in VNHR Area #3. (NPS 09-17:1596, 12/17/09)

FIGURE 103. Left: Phoenix military button "JE RENAIS DE MES CENDRES" from TU3-12 at Kanaka House in VNHR Area #3 (NPS 10-01:150, 4/19/10). Right: Image of a Phoenix button courtesy of California State Parks (www.parks.ca.gov/?page_id=789, accessed April 16, 2010).

FIGURE 104.Gunflints from TU3-07 at Tayentas House (left), and TU3-12 at Kanaka House (right), in VNHR Area #3. (NPS 09-17:065, 12/17/09)

The mean dates for ceramic sherds recovered at Kanaka House (n=77) show that the majority of these artifacts date from ca. 1845 (n=69) (Figure 105). The ceramic types with a mean date of ca. 1845 include white earthenware (41%, n=28), transferprinted earthenware (38%, n=26), and ironstone (13%, n=9); with lesser quantities of mochaware (n=2), yellow ware (n=2), banded ware (n=1), and cottageware (n=1). Two transferprinted earthenware sherds each have mean ceramic dates of ca. 1840 and ca. 1850. One ironstone sherd has a mean ceramic date of ca. 1875. Three sherds of industrial porcelain have a mean ceramic date of 1925. The variety of ceramic wares and the strong primary mode at ca. 1845 is consistent with HBC Village houses at Fort Vancouver.

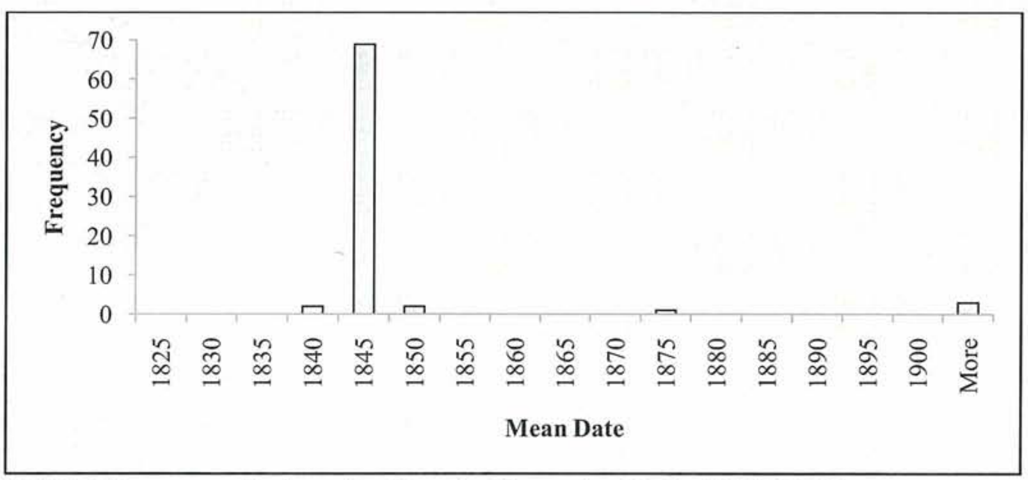

FIGURE 105. Mean ceramic dates for Kanaka House (σ=16.1). (NPS 2010)

9566

The window glass thickness of the total number of fragments at Kanaka House (n=229) has a primary mode of 0.045 in. (n=99) corresponding to a date range of 1830-1845 (Figure 106). Taken together, the large number of glass fragments with a pre-1845 date range (a total of 185 fragments with a thickness mode of 0.055 in. or less, or 81% of all fragments) yields a very strong primary mode that is within the HBC period at Fort Vancouver.

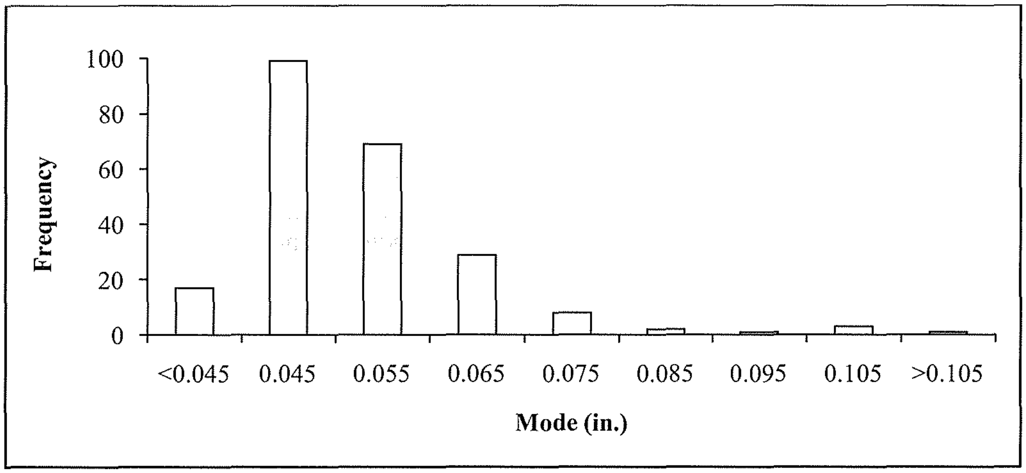

FIGURE 106. Window glass thickness at Kanaka House. (NPS 2010)

The majority of the total number of vessel glass fragments from Kanaka House (n=200) show no temporally diagnostic attributes (n=189); however, nine fragments are from blown-into-mold vessels and two fragments are from turn mold vessels. These manufacturing methods both typically date from before 1900. One fragment is from a machine made vessel.

Nails recovered at Kanaka House (n=95) are exclusively square nail varieties, with 9 wrought nails and 86 square nails. The lack of wire nails in these units is strong evidence that this archaeological deposit is from a 19th-century structure.

Although the Kanaka House area was excavated in 1981, an abundance of temporally diagnostic artifacts – almost exclusively 19th century (98%, n=405) – was recovered during testing for the CRC project (Figure 107). The large quantity of 19th-century architectural material in the form of window glass and square nails (27.6%, n=320), together with the large quantity of personal and domestic items (34%, n=394), supports the findings of Thomas and Hibbs (1984:312-324) that this is the location of a Village structure. Historical maps and documents identify this structure as Kanaka House. Footing Features22 and 26 located within the Kanaka House excavation units are likely structural remains of the house. Features 23, 24, and 25 are likely associated with domestic tasks at Kanaka House.

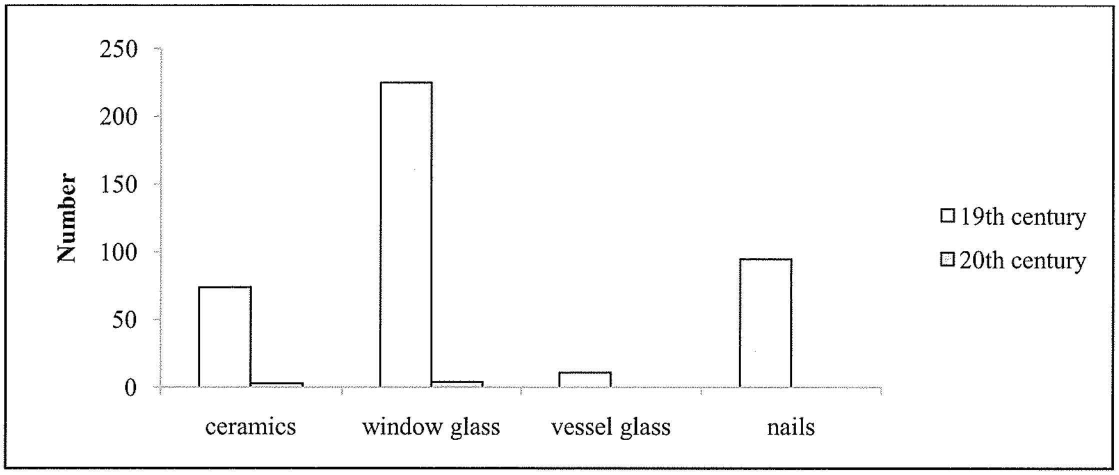

FIGURE 107. Distribution of temporally diagnostic artifacts at Kanaka House. (NPS 2010)

1840s Tayentas House

Archaeological deposits and features from the 1840s Tayentas House, located southeast of Kanaka House inside a gated security area, were encountered in TU3-01, TU3-02, TU3-03, TU3-05, TU3-06, TU3-07, TU3-08, and TU3-16; and in Trench 3-03, Trench 3-05, Trench 3-06, Trench 3-07, Trench 3-08, and Trench 3-10 in the southern portion of VNHR Area #3. These units encompass an area approximately 20 m in diameter. Sample profiles of these units are shown in Figures 108-109. Excavation units avoided the direct footprint of Tayentas House.

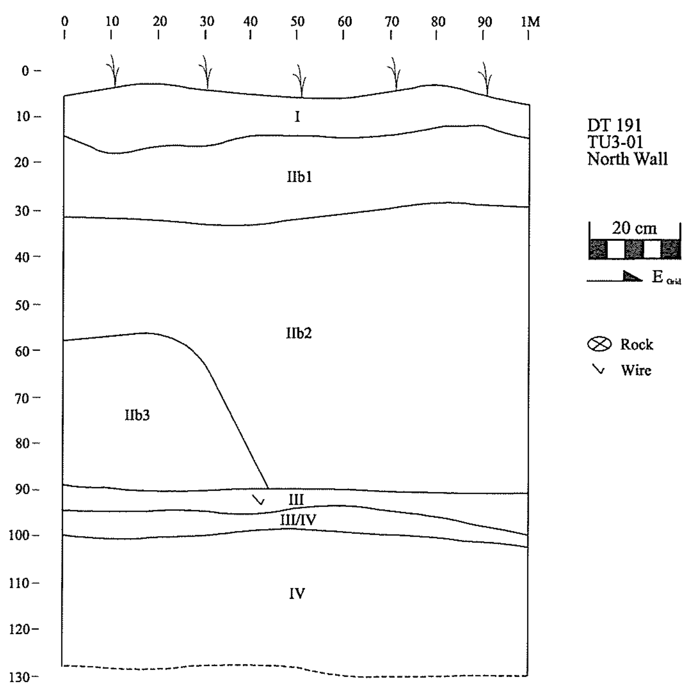

FIGURE 108. North wall profile of TU3-01 showing the buried intact Tayentas House sediments below 90 cm of fill. (NPS 2010)

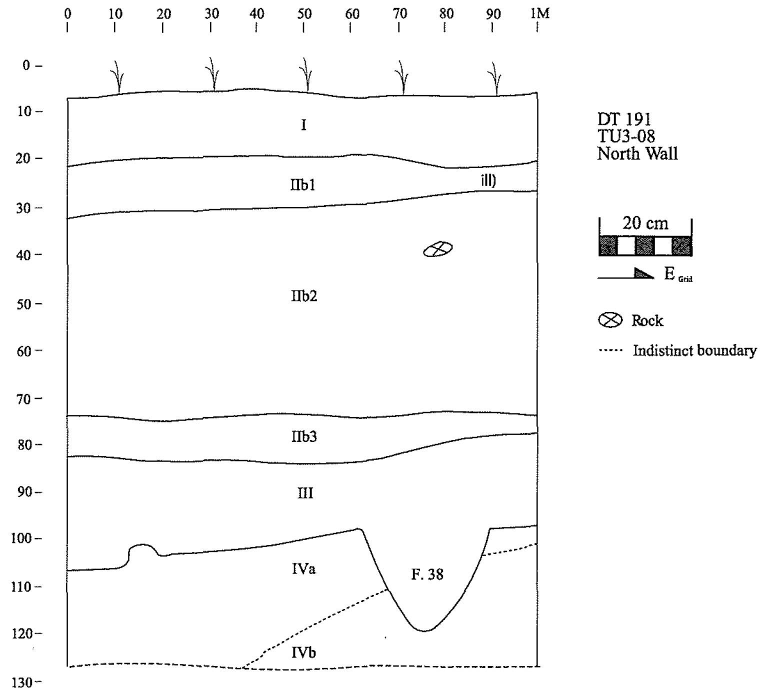

FIGURE 109. North wall profile of TU3-08 showing the buried intact Tayentas House sediments and Feature 38 below 80 cm of fill. (NPS 2010)

Three features associated with the house were observed in TU3-02, TU3-03, and TU3-08. Feature 17 is a post and posthole in TU3-02, Feature 18 is a posthole in TU3-03, and Feature 38 is a pit in TU3-08.

The cultural material associated with these excavation units consists predominantly of 19th-century artifacts. A typological classification of these objects is presented in Table 22. Probable modern artifacts that are not included in Table 22 include asphalt and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the Tayentas House TUs in the volumetrics table (Table 18), and the number of artifacts from these units in the typology table.

Greater than 28% (n=906) of the artifact assemblage in Table 22 consists of personal items – predominantly alcohol bottle fragments (25%, n=791) and tobacco pipe fragments (3.2%, n=100) (Figures 110-111) – but also a small quantity of beads (Figure 102), buttons (Figures 112-113), jewelry (Figure 114), and leather. Domestic items, dominated by ceramics (21.7%, n=686) and unworked bone (4.6%, n=145), constitute 26.3% (n=833) of the artifacts recovered. One gunflint was found (Figure 104). Architectural material, consisting mainly of flat glass and nails, comprises only 20.3%, (n=641) of the assemblage – perhaps because the footprint of the house itself was avoided. Items recovered whose function could not be determined (24.3%, n=766) consist primarily of bottle glass, glass sherds, and metal fragments.

TABLE 22
CHARACTERISTICS OF ARTIFACTS AT THE 1840s TAYENTAS HOUSE

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Button	I.A	3	0.09
Button Fragment	I.A	1	0.03
Button, 4-Holed	I.A	1	0.03
Shoe Leather	I.A	2	0.06
Amethyst Glass Pendant	I.C	1	0.03
Bead, Drawn	I.C	7	0.22
Bottle, Alcohol	I.G	789	24.98
Bottle, Beer	I.G	2	0.06
Pipe, Tobacco	I.G	100	3.17
Total		**906**	**28.7%**
Domestic Items			
Bone, Unworked	II.B.2	145	4.59
Earthenware	II.B.2	373	11.81
Earthenware, Transferprinted	II.B.2	256	8.11
Glassware Sherd	II.B.2	1	0.03
Ironstone	II.B.2	14	0.44
Porcelain	II.B.2	9	0.28
Stoneware	II.B.2	34	1.08
Lamp Glass	II.B.3	1	0.03
Total		**833**	**26.4%**
Architecture			
Flat Glass	III.B.1	312	9.88
Wood, Unworked	III.B.1	5	0.16
Wood, Worked	III.B.1	4	0.13
Bolt/Nut	III.B.1	1	0.03
Metal Staple	III.B.2	1	0.03
Metal Wire	III.B.2	2	0.06
Nail, Machine-cut	III.B.2	1	0.03
Nail, Square	III.B.2	71	2.25
Nail, Unidentified	III.B.2	3	0.09
Nail, Wire	III.B.2	60	1.90
Nail, Wrought	III.B.2	13	0.41
Pigment on Wood	III.B.2	1	0.03
Clinker	III.E	1	0.03
Coal	III.E	166	5.26
Total		**641**	**20.3%**

Continued on next page

TABLE 22
CHARACTERISTICS OF ARTIFACTS AT THE 1840s TAYENTAS HOUSE (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Commerce and Industry			
Gunflint	V.B	1	0.03
Clay Pigeon	V.B	9	0.28
Bottle, Medicine	V.J.6.b	2	0.06
Total		**12**	**0.4%**
Unknown			
Bisque	VIII	11	0.35
Unidentified Metal Artifact	VIII.A	5	0.16
Metal Disc	VIII.A	1	0.03
Metal Fragment	VIII.A	56	1.77
Metal Ring Fragment	VIII.A	4	0.13
Metal Strap	VIII.A	2	0.06
White Metal Fragment	VIII.A	1	0.03
Bottle Glass	VIII.B	564	17.86
Glass Sherd	VIII.B	122	3.86
Total		**766**	**24.3%**
GRAND TOTAL		**3158**	

FIGURE 110. Clay tobacco pipe fragments from TU3-06, Level 3, at Tayentas House in VNHR Area #3. (NPS 09-17:1231, 12/15/09)

FIGURE 111. Clay tobacco pipe fragments from TU3-08, Level 3, at Tayentas House in VNHR Area #3. (NPS 09-17:1229, 12/15/09)

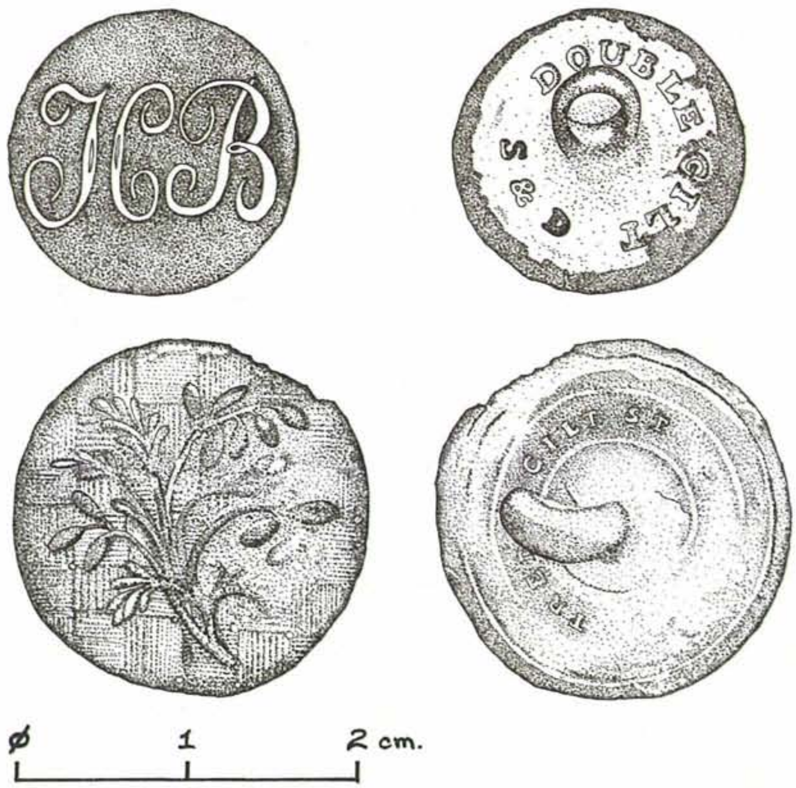

FIGURE 112. Metal buttons from Tayentas House in VNHR Area #3. "HB" (Hudson's Bay) button (upper two drawings) has "DOUBLE GILT S&D" on the back. "S & D" may be Sherlock & Dawes of London, manufacturers of military buttons pre-1837. Basketweave button with the floral overlay (lower two drawings) has "TREBLE GILT STAND COLOUR" on the back. Illustrations by Jeremy Harrison.

FIGURE 113. Hudson's Bay Company button (illustrated in Figure 112) from TU3-06 at Tayentas House in VNHR Area #3. (NPS 09-17:32, 12/17/09)

FIGURE 114. Amethyst glass pendant from TU3-08 at Tayentas House in VNHR Area #3. (NPS 09-17:1156, 12/17/09)

The mean dates for the ceramic sherds recovered at Tayentas House (n=686) show that the majority of these artifacts date from ca. 1845 (96.9%, n=665) (Figure 115). Ceramics with a mean date of ca. 1845 are predominantly earthenware types (89.7%, n=615), including white earthenware (44.8%, n=307) and transferprinted earthenware (35.3%, n=242), with lesser quantities of yellow ware (n=23), cottageware (n=17), lusterware (n=14), mochaware (n=6), banded ware (n=5), and Rockingham ware (n=1). Other ceramic types with a mean date of ca. 1845 include Chinese stoneware (n=24), English stoneware (n=10), Gothic ironstone (n=7), Chinese porcelain (n=6), and English porcelain (n=3). Fourteen transferprinted earthenware sherds have a later mean ceramic date at ca. 1850. Seven ironstone sherds have a mean ceramic date of ca. 1875. The very strong primary mode at ca. 1845 is consistent with the HBC period at Fort Vancouver. The diversity of the assemblage is similar to that found at House 4/4B.

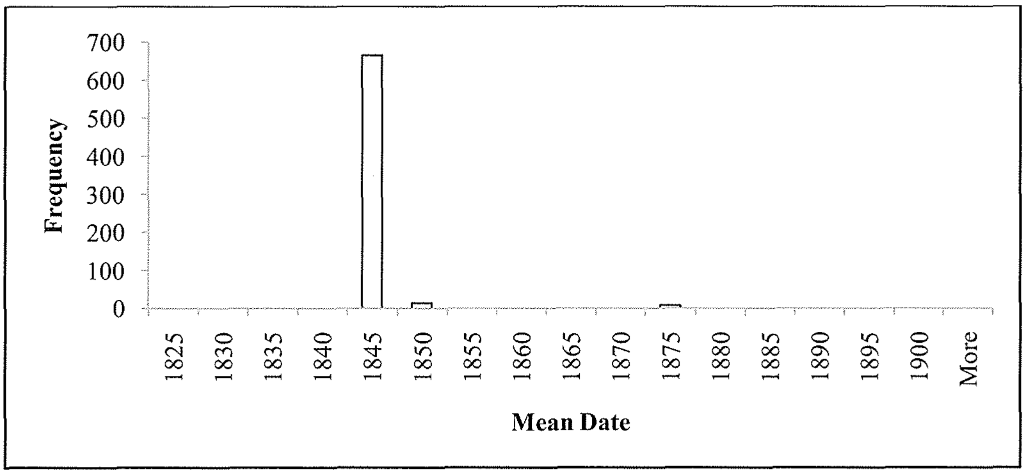

FIGURE 115. Mean ceramic dates for Tayentas House (σ=3.2). (NPS 2010)

The window glass thickness of the total number of fragments at Tayentas House (n=312) has a primary mode of 0.045 in. (n=117) corresponding to a date range of 1830-1845 (Figure 116). Taken together, the large number of glass fragments with a pre-1845 date range (a total of 225 fragments with a thickness mode of 0.055 in. or less, or 72% of all fragments) yields a very strong primary mode that is within the HBC occupation period at Fort Vancouver and similar to the distribution found at Kanaka House.

The majority of the total number of vessel glass fragments from Tayentas House (n=1481) show no temporally diagnostic attributes (n=1083). There is a large number of fragments made by methods that typically date from before 1900 (n=397, or 26.8% of all vessel glass fragments). Among these pre-1900 fragments, five are from free blown vessels, 381 are from blown-into-mold vessels, and 11 are from turn mold vessels. One fragment is machine made.

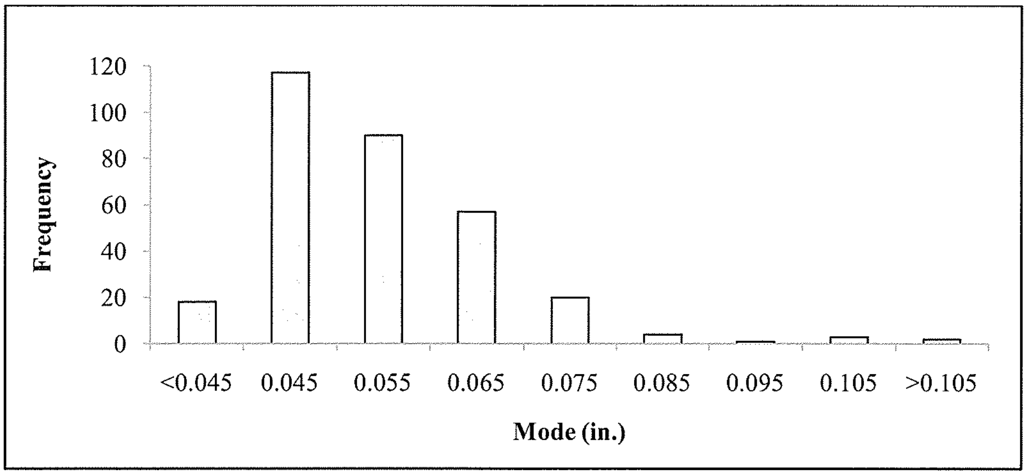

FIGURE 116. Window glass thickness at Tayentas House. (NPS 2010)

The assemblage of nails recovered at Tayentas House (n=148) is biased toward square nails (Figure 117). The total number of all varieties of square nails (n=88) outweighs the number of wire nails (n=60). Fifty of the wire nails (83%) are from one excavation unit level, however, suggesting a post-1900 activity at that specific location that resulted in the deposition of a large quantity of modern nails.

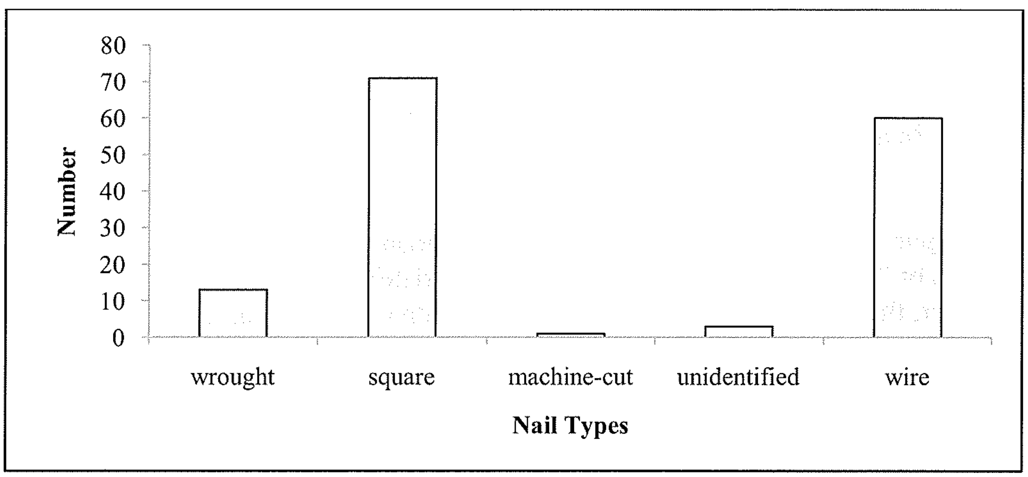

FIGURE 117. Nail types at Tayentas House. (NPS 2010)

The temporally diagnostic artifacts recovered from the Tayentas House excavation units consist almost exclusively of 19^{th}-century artifacts (96%, n=1478) (Figure 118). The quantity of predominantly 19^{th}-century architectural material in the form of window glass and nails (12.5%, n=395), together with the large number of 19^{th}-century ceramics (21.7%, n=686) and other personal and domestic items (33.3%, n=1053) provides strong evidence that this is the location of a Village structure. Historical maps and documents identify this structure as the house of Joseph Tayentas.

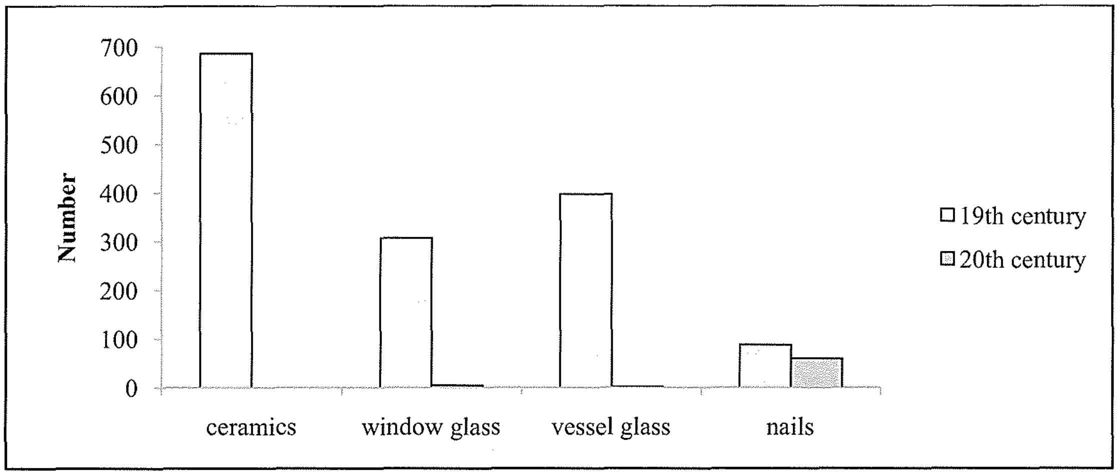

FIGURE 118. Distribution of temporally diagnostic artifacts at Tayentas House. (NPS 2010)

CONCLUSIONS AND RECOMMENDATIONS

VNHR Area #3 of the CRC APE (U.S. Army property) has been affected by numerous episodes of building, road, and railroad construction, relocation, and demolition over the past 175+ years. Exploratory trenching with a backhoe proved to be an efficient and economical method of investigating the stratigraphy and the extent of surviving cultural deposits. The depth of fill layers observed in the 39 backhoe trenches in this portion of the project area ranged from 24 cm to greater than 210 cm, with an average depth of 80-100 cm.

In spite of previous disturbances, intact 19th- and early 20th-century cultural deposits and features are still present below fill layers within this area of the CRC APE. Some of this fill was deposited intentionally in the 1980s to protect archaeological resources. Archaeological deposits are persistent and enduring.

The results of test excavations in Area #3 of the VNHR indicate that archaeological resources that were tested that contribute to the significance of the VNHR District are present within this portion of the CRC APE (Table 23). A thorough discussion of the significance of these resources is presented in Chapter 10. The 1850 McLoughlin Road and 1880s McLoughlin Road Tree Allée are treated in more detail in Volume II of this report on the historical built environment.

Thomas and Hibbs (1984:312-324) Kanaka House excavation block and features (OP20A, Phase II) were relocated and are largely intact. Thomas and Hibbs (1984:405-410) excavations were also relocated just south of East 5th Street (OP52B).

Undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to 19th-century structures, may still exist below fill layers within the U.S. Army area of the CRC APE. The areas of the 1892 U.S. Army Stable, 1859 Quartermaster's Stable complex, and the entire southern portion of VNHR Area #3 within the HBC Village, will require stripping of overburden and fill to test for buried intact deposits and deep features.

TABLE 23
ARCHAEOLOGICAL RESOURCES LOCATED WITHIN VNHR AREA #3

Description	Significance Criteria*
1892 U.S. Army Stable	d
1859 Quartermaster's Stable	d
1850 McLoughlin Road	a, d
1880s McLoughlin Road Tree Allée	a, d
1840s HBC Village, Kanaka House	a, c, d
1840s HBC Village, Tayentas House	a, b, c, d

*Criteria a-d of the NRHP contributing to the significance of the VNHR District

NPS archaeological testing in VNHR Area #3 has demonstrated that the CRC project as proposed will have adverse effects on cultural resources that contribute to the significance of the National-Register-listed VNHR District. Unique and irreplaceable resources on the VNHR within the CRC APE will be destroyed. Resources that may survive the direct effects of the project may lose their eligibility for the NRHP through a loss of integrity. An additional adverse effect will occur when resources are transferred out of federal ownership and lose their protection under federal cultural resources protection laws.

Adverse effects to the cultural resources detailed in this report must be resolved under 36 CFR 800.6. Adverse effects to cultural resources within the CRC APE should be avoided, if possible. If adverse effects cannot be avoided, plans to mitigate these effects should be developed through 36 CFR 800.6 or alternative processes. These efforts should be coordinated with those mitigation requirements associated with Section 4(f) of the U.S. DOT Act of 1966.

CHAPTER 8

VNHR AREA #4: HBC VILLAGE

PROJECT AREA

VNHR Area #4 is located approximately 0.2 km (0.12 mi.) north of the north shore of the Columbia River in the SE quarter of the SW quarter of the SE quarter of Section 27, T2N, R1E, Willamette Meridian. The elevation of this area is approximately 30 ft. above mean sea level (NGVD 29).

The CRC APE in VNHR Area #4 was in the southwest and south portions of the Fort Vancouver Hudson's Bay Company Village north of SR 14 and east of the ramp that leads from northbound Interstate 5 to Vancouver City Center (Figure 119). The area was bounded on the northwest by a chain link fence at the U.S. Army property boundary and on the southeast by Maya Lin's Confluence Project Vancouver Land Bridge. The project area was oriented northwest/southeast and measured approximately 150 m (492 ft.) long by 10 m (32.8 ft.) wide, encompassing an area of approximately 0.15 ha (0.37 ac.). The natural setting consisted of a flat field with mowed grasses and weeds on the Columbia River floodplain. Some small shrubby vegetation was present along a chain link fence that separated the VNHR from SR 14 on the southwest.

PROJECT GOALS

Six goals that were addressed through archaeological testing in VNHR Area #4 within the CRC APE mainly concerned the Hudson's Bay Company (1829-1860) period:

1. To attempt to relocate excavations by Kardas (1969), Chance and Chance (1976), and Thomas (1993-1994) to evaluate the extent of these excavations and the significance of the remaining archaeological resources that they left in the ground.
2. To test for archaeological evidence of HBC-era houses or other structures located in the Fort Vancouver Village.
3. To test for traces of the roads and utilities shown on historical maps from the mid-to-late 1800s.
4. To test for archaeological evidence of the pond at the southeast portion of the CRC APE to better define its boundaries.
5. To record historical archaeological resources greater than 50 years old.
6. To achieve a better understanding of the archaeological resources in this portion of the Fort Vancouver Village and the VNHR to guide further investigations and to better educate the public on the significance and history of the area.

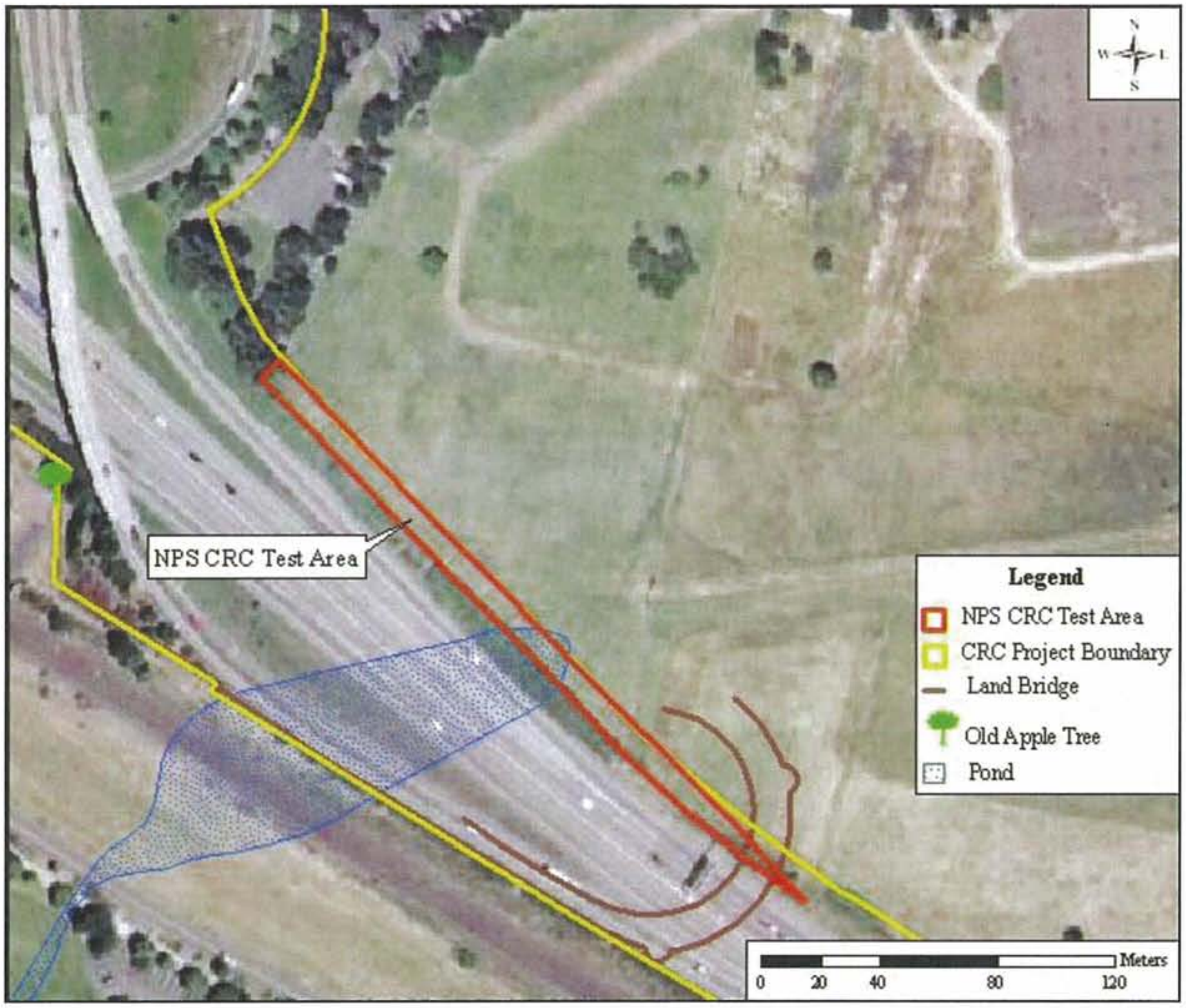

FIGURE 119. The area of NPS archaeological testing in VNHR Area #4 on NPS property for the CRC project. Image from Google Earth. (NPS 2010)

HISTORICAL CONTEXT

Historical records and maps were consulted to help determine the cultural resources that were present in VNHR Area #4, where they were located, and if they were likely to be affected by construction during the CRC project. GIS layers digitized from historic maps in the Fort Vancouver archives were georeferenced to modern satellite images (Figure 120).The location of buildings and features helped guide the placement of archaeological test units.

Hudson's Bay Company, 1824-1860

Historical maps show that VNHR Area #4, west of Fort Vancouver , and between East 5th Street on the north and SR 14 on the south, was part of the HBC Village, a multicultural settlement where the engagés and employees of the Company – servants, tradesmen, laborers, trappers, and voyageurs – lived in small houses with their families. A salmon store, hospital, workshops,

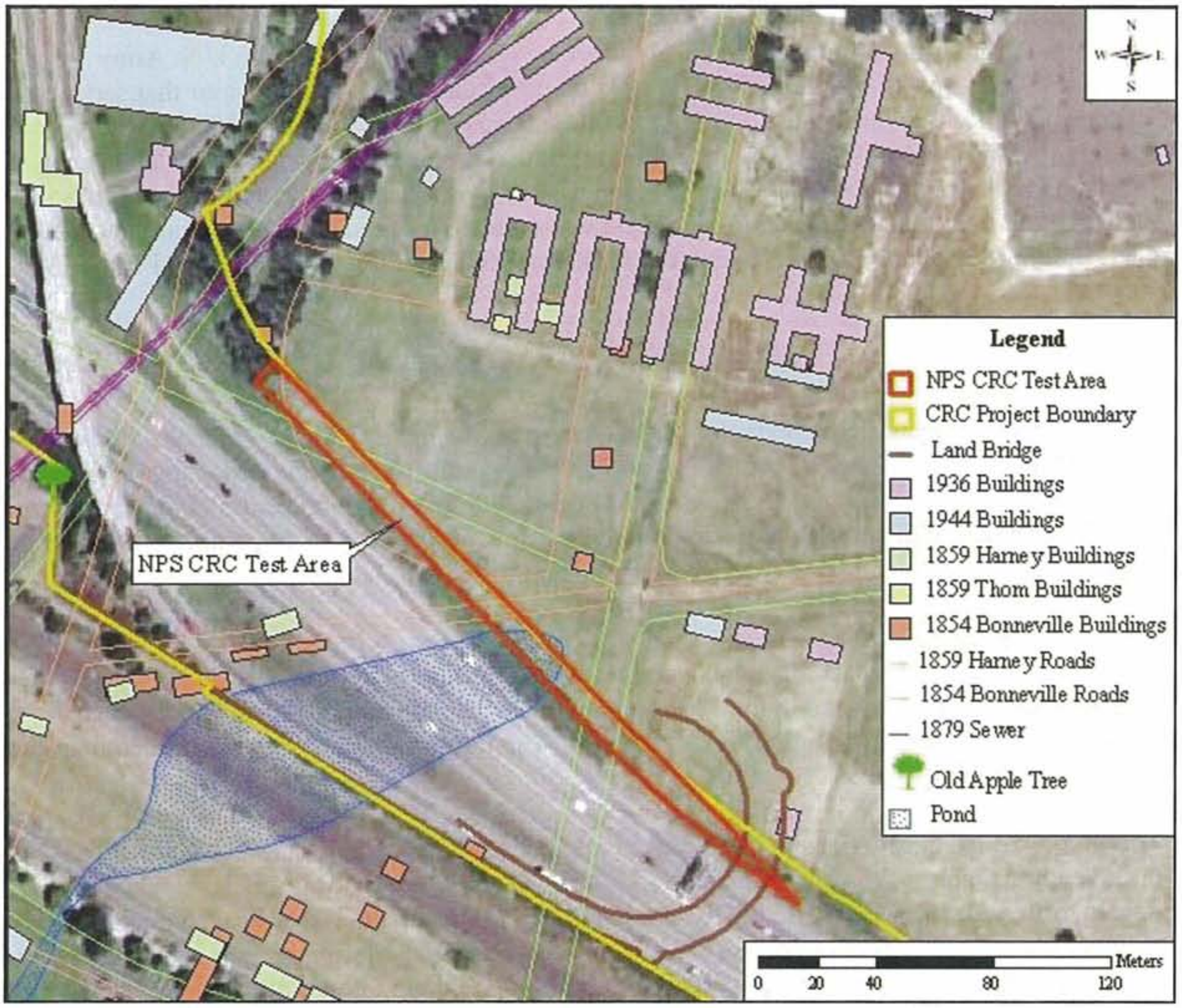

FIGURE 120. VNHR Area #4 in the HBC Village overlain with historical buildings and features. Image from Google Earth. (NPS 2010)

storehouses, sheds, and stables were located in the area of the HBC wharf on the Columbia River. Hussey (1957:218) states that by the late 1840s, as many as 75 structures may have been present within the Village. The number and location of Village structures changed throughout the period of occupation of the HBC as well as seasonally (Figure 3). Although only one or two Village houses are recorded within VNHR Area #4, it is possible that the remains of other structures are present in this area and may be adversely affected by the CRC project.

Early roads also crisscross this area. The Village pond was present in the eastern portion of the project area until the early 1900s. It last appears on the 1906 Hubbard map (Figure 56) and was finally filled in during the construction of the railroad.

U.S. Army, 1849-1947

U.S. Army ground-disturbing activities in this area were minimal. No known U.S. Army structures were present within the VNHR Area #4 project area. The railroad spur that serviced Vancouver Barracks was located on the far western edge of this portion of VNHR Area #4, roughly in the same location as the chain link fence that separates the NPS HBC Village area from the U.S. Army property. The Village area was used as a firing range and polo grounds in the early 20th century, and Pearson Airfield runways were expanded into this area in the 1920s. CCC buildings and activities were centered farther north, in the area of House 2 and House 3.

ARCHAEOLOGICAL CONTEXT

The following projects were conducted within the Fort Vancouver Village ("Kanaka Village"), 45CL300, in and near the CRC APE. The earliest excavations were conducted using methods generally accepted before the 1966 passage of Section 106 of the NHPA and probably would not meet 21st-century standards. Summaries are given below of the portions of projects most relevant to the archaeological context of VNHR Area #4 (Figure 121).

Early Village Investigations

The first exploratory archaeological excavations in the Village were probably done by NPS archaeologist Louis Caywood in the 1950s when he was establishing the location of the HBC stockade and the buildings within Fort Vancouver. The information was never included in any of his reports (Kardas 1970:9).

The first recorded excavations in the Village took place in 1968, when Larrabee and Kardas discovered evidence of the Fort Vancouver Village 700-800 ft. west of the HBC stockade. Several 5 ft. wide trenches were dug by hand, and 3 x 3 ft. test units were excavated within the trenches alternating with 3 x 3 ft. baulks. In general, the artifact-bearing stratum was located 3-6 in. below surface. Limited or no screening for artifacts was done throughout this project. A general scatter of HBC-era artifacts was observed throughout the test units. One domestic concentration was excavated more extensively and was interpreted as a HBC-era structure (House 1). These excavations were located north of VNHR Area #4.

A second round of investigations was conducted the following year (Kardas 1970, 1971) to locate additional structures and features and to better establish the extent of the Village. A tractor with a 6 ft. blade was used to remove the sod layer; all other excavation was done by hand. Screening of sediments was only done in areas of high artifact concentration. As in 1968, archaeological resources were found close to the surface, within 12 in. Three HBC-era houses (Houses 2, 3, and 4), animal burials (2 horses, 1 pig, and 1 dog), and other features (well, rock feature, wood-lined pit associated with House 3, and 20th-century trash pit) were located. The maximum depth of any of the features (the well and wood-lined pit) was 36 in. Two swaths that extend into VNHR Area #4 paralleled the NPS boundary fence. No mention is made of artifacts that may have been recovered from the surface of these swaths. One test pit was excavated within the westernmost swath with few artifacts and no features located.

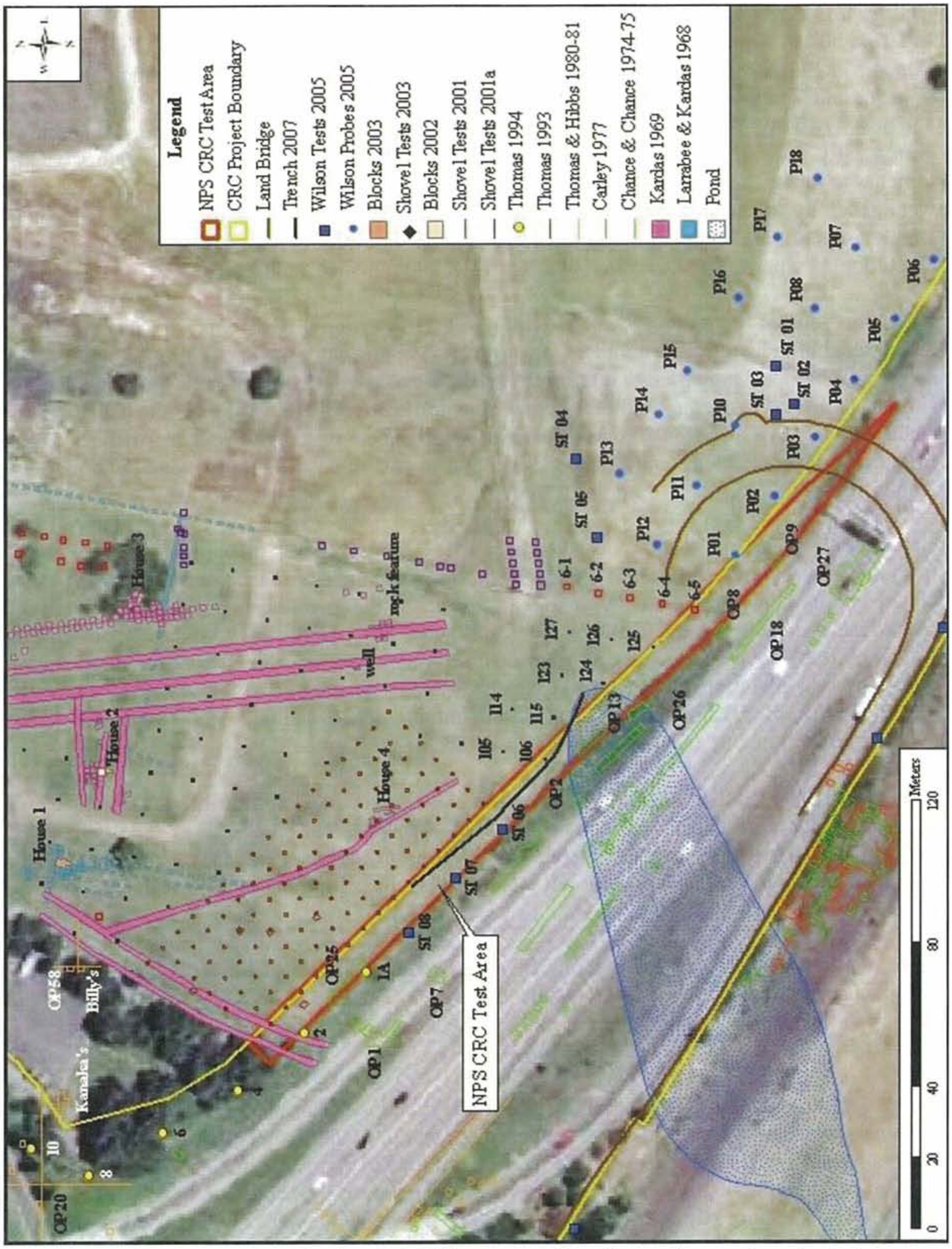

FIGURE 121. VNHR Area #4 in the HBC Village overlain with previous archaeological investigations. Image from Google Earth. (NPS 2010)

Chance and Chance 1976 and 1982, Carley 1977

In 1974 and 1975, the University of Washington conducted salvage operations in the Village and Vancouver Barracks ahead of proposed improvements to the Interstate 5/SR 14 interchange (Chance and Chance 1976, 1982). Operations 8, 9, and 25 located along the SR 14 right-of-way, and possibly portions of Operations 2, and 13 located in the north end of the pond, are within the current CRC APE. Excavations were conducted manually except for limited exploratory backhoe trenches to locate the pond and to remove modern fill on its northwest side. Excavated sediments were generally screened through ¼ in. mesh with only a few exceptions: to speed the work in a small number of areas containing few artifacts, and in the waterlogged pond deposits of Operation 21 where artifact recovery was by troweling (Chance and Chance 1976:18).

Operation 8 tested for the presence of structures east of the pond. HBC-era artifacts were recovered, but in insufficient numbers to warrant an expansion of the operation. A slight subsurface hardpan suggested that the area had once been under cultivation. Operation 9 was similarly indicative of an agricultural field with a thin scatter of HBC-era artifacts (Chance and Chance 1976:26). Operation 25 was an area of disturbance with a low density of artifacts dating from the HBC era (Chance and Chance 1976:35). An area of 63 $ft.^2$ was excavated with one feature recorded.

Operation 2 was interpreted as a post-World War II U.S. Army trash pit capped by 1 ft. of HBC fill that had been pushed on top of the recent trash by machinery (Chance and Chance 1976:22). An area of 50 $ft.^2$ was excavated with no features recorded. Operation 13 was part of the HBC pond trash deposit with a moderate density of artifacts. The 1 ft. thickness of deposits in Stratum 9 (3.8-4.8 ft. below surface) in the westernmost test pit was greater than that observed in any of the other pond operations (Chance and Chance 1976:29). An area of 50 $ft.^2$ was excavated with no features recorded. Lithic artifacts and significant numbers of faunal remains were recovered in Operations 13 and 25 (Chance and Chance 1976:246).

The authors believed that the surface of Stratum 10 observed in Operation 11, beginning at a depth of 4.8 ft., represented the bottom of the pond at the arrival of the HBC in 1825 (Chance and Chance 1976:28). As with the Larrabee and Kardas (1968) and Kardas (1970) excavations described above, many features were left intact to aid future interpretation (Chance and Chance 1976:19).

Carley (1977) continued the excavation of features south of SR 14 to define the HBC Riverside Complex and further explore pond deposits in that area. These excavations were south of VNHR Area #4 and the current CRC APE.

Thomas and Hibbs 1984

From 1980 through 1983, Thomas and Hibbs (1984) conducted further excavations in the Village and Vancouver Barracks ahead of the proposed relocation of the Interstate 5/SR 14 interchange. Although the majority of the excavations carried out for that project were located to the west and south of the current CRC APE, two areas are worth mentioning. Operation 58 (Thomas and Hibbs 1984:619), approximately 50 m north of VNHR Area #4, appears to be the location of a HBC-era house. Based on an analysis of historical maps, this house (labeled "Billy's" on the 1846 Covington map in Figure 53) is inferred to be that of William R. Kaulehelehe, a Hawaiian preacher also known as Kanaka William or Kanaka Billy. Billy's house appears to be in line with and west of Houses 1, 2, and 3 located by Kardas (1968, 1970). Two 5 x 5 ft. units were excavated in 0.5 ft. levels to a depth of approximately 3 ft. Stratum 1 was shoveled out; Strata 2 and 3 were excavated with shovel and trowel, and sediments were screened through ¼ in. mesh. Two features, the remains of posts in circular holes, were located at a depth of one ft.

Remains of another structure located at Operation 20A, Phase 2 (Thomas and Hibbs 1984:312-324) are presumed to be the house west of "Billy's" that is labeled "Kanaka's" in Figure 53. Six 5 x 5 ft. units were excavated stratigraphically. Stratum 1 was shoveled out without examination; Stratum 2 was missing. Stratum 3 was excavated with shovel and trowel, and sediments were screened through ¼ in. mesh. Two units were excavated to sterile sediments; three units were dug to the 3B activity surface then backfilled to preserve them for future excavation. The remains of three posts and their postholes were recorded at a depth of 1.1-1.9 ft. No mention is made of archaeological resources extending below these features. Thomas and Hibbs (1984:317) report that there was extensive disturbance in this area from the construction of a sidewalk, sewage and drainage trenches, and pipes, and that excavation units were positioned to minimize encountering these disturbances.

When the railroad spur that was previously located on the west side of the Village was removed in the 1970s, the area was graded flat. After the Thomas and Hibbs excavations (1984) and before the construction of the U.S. Army buildings currently occupying the northwest corner of the Village south of East 5th Street, the demolition of the existing buildings was monitored to confine impacts to the previously disturbed areas. A large amount of gravel and sand fill was then placed in this area. Thomas and Hibbs state that this was to protect archaeological resources such as Billy's and Kanaka's houses to mitigate the effect of building construction and paving to these resources (Thomas and Hibbs 1984:718).

The results of the Thomas and Hibbs (1984) excavations have helped ground-truth historical maps and images and have enabled archaeologists to better predict the location of other Village structures. Kanaka's house is located adjacent to VNHR Area #3, the U.S. Army property west of Fort Vancouver National Historic Site. One house that has not been located archaeologically is recorded just northwest of VNHR Area #4 on its boundary with VNHR Area #3 (Figure 58) and may be discovered during test excavations for the CRC project.

Thomas 1993-1994

Thomas (1993) conducted archaeological investigations for WSDOT's proposed pedestrian undercrossing of SR 14 in the Village. A surface survey, a ground penetrating radar survey using a 500 MHz antenna, and test excavations were conducted on a 300 x 140 ft. grid on the north side of SR 14. Approximately the southern 30 ft. of this grid is located in VNHR Area #4 within the current CRC APE.

The surface survey recovered a small quantity of 19th-century artifacts, but mostly 20th-century items and modern debris. The ground penetrating radar survey detected several subsurface anomalies that were ground-truthed with test units, with a 71% correlation between the two techniques of archaeological feature discovery (Thomas 1993:34). Five subsurface features were observed, including pond deposits (SSF #1), House 4 (SSF #2) discovered by Kardas (1969), and a concentration of coal from a known U.S. Army coal storage area (SSF #5), all of which are at least partially within VNHR Area #4.

A total of 112, 1 ft. diameter shovel probes were excavated on the grid at an interval of 20 ft. Sediments were screened through ¼ in. mesh. Five 5 x 5 ft. test units were excavated in the area of the proposed pedestrian structure foundations in the west portion of the project area, in places where in situ 19th-century archaeological material was expected (Thomas 1993:16). Four features were observed in these test units. Feature 1 was a coal deposit located at a depth of 0.5 ft. Feature 2, an asphalt surface observed at 0.3 ft. (9 cm), was located in a test unit within VNHR Area #4. Feature 3 and Feature 4 were HBC-era fire pits that were left in situ at a depth of 1.5 ft. In general, probes and features were excavated to a depth of 2-3 ft. Cultural material was generally found within the top foot of sediments below a fine layer of angular crushed rock and a thin lens of coal at 0.5 ft. In his soils description, Randolph reported that cultural disturbance is extensive within the western half of the grid, probably due to the previous leveling of the area for a coal storage facility that resulted in the removal of the B horizon and the mixing of 19th- and 20th-century deposits (Thomas 1993:45).

Thomas concluded that much of the western portion of this project area was disturbed by 20th-century U.S. Army activities including coal storage and other work associated with the nearby railroad spur; HBC and early U.S. Army-era debris from refuse disposal in the pond was found in the eastern portion of the project area. Thomas cautioned that intact HBC-era material containing significant archaeological data probably underlie 20th-century disturbances throughout the project area.

In 1994, Thomas excavated additional shovel probes after the modification of WSDOT's proposed pedestrian undercrossing of SR 14, to avoid significant archaeological resources in the Village located by Thomas in 1993. Nineteen 1 ft. diameter probes were excavated in the right-of-way between the chain link fence that marks the U.S. Army and WSDOT property boundary, and SR 14 (Thomas 1994:8). Probe 1A and Probe 2 are in VNHR Area #4 within the current CRC APE. The maximum depth of fill material observed in these probes, usually imported sand, and gravel, was 12 and 8 in. respectively, although the average for the entire area was 21 in. No mention was made of the artifacts recovered from Probe 1A; however, 20th-century artifacts comprise the majority (63%) of the total artifacts. Probe 2 contained 83% of the coal recovered from all 19 probes. By today's standards, such small, widely spaced probes would be considered only minimally sufficient for testing.

Field School 2001-2003

From 2001 through 2003, TUs and STs were excavated throughout the untested portions of the Village during the Portland State University/Washington State University Fort Vancouver Public Archaeology Field School. The 2001 STs were mainly located north of the project area; however, several were excavated around the Village gate and between the Village gate and the SR 14 right-of-way. The area is noticeably mounded around the entrance gate and to the west. Artifacts recovered include mixed 19th- and 20th-century artifacts with asphalt, concrete, and coal deposits to a depth of 80 cm, possibly associated with the demolition of CCC-era structures or the powder magazines. Five STs were excavated between the Village gate and the SR 14 right-of-way (ST6-1 through ST6-5). These units confirmed that the mounded area, observed to pinch out to the north within 10 m of the gate, similarly pinched out within 10 m of the gate to the south. Artifact densities dropped off to the south, with moderate numbers of mixed 19th- and 20th-century artifacts in ST6-1 through ST6-3, and few historical artifacts in ST6-4 and ST6-5 (Wilson 2005:15).

Nine of the 2003 shovel tests, ST105, ST106, ST114, ST115, and ST123 through ST127, are within or near VNHR Area #4. ST105, ST106, and ST114 were excavated on the edge of the mounded area first explored in 2001, which extends from the Village gate south into the pond area. Although not as deep as the area near the Village gate, ST105, ST106, and ST114 encountered similar fill to a depth of 30 cm, with sparse 19th-century artifacts in the intact deposits beneath. ST127, on the southern edges of the mound, contained about 80 cm of fill with only moderate numbers of 19th-century artifacts beneath. ST125 and ST126, to the south of ST127, also contained mixed deposits to 30-40 cm, with pure late 19th-century deposits beneath. These units appeared to be on the northeastern edge of the pond, and revealed a series of fill episodes related to late 19th- century and early-to-mid 20th-century U.S. Army activities (Wilson 2005:15). ST115, ST123, and ST124, excavated within the pond, contained dense deposits of mixed 19th- and 20th-century artifacts in the upper levels with pure 19th-century deposits of artifacts below about 80 cm. In all three of these STs, the excavations were terminated without reaching the bottom of the pond. It is not known how deep the pond deposits extend in this area (Wilson 2005:16).

Most of the remote sensing surveys that have been conducted in the Village have been located in the central and northern portions of the Village. However, in 2003, a resistivity survey was conducted by Kvamme that covered a portion of the CRC project area within VNHR Area #4. The results of the survey (Figure 122) were used in conjunction with the results of the GPR and magnetometer surveys conducted for the CRC project to identify anomalies for subsurface testing.

Land Bridge 2005-2007

Wilson (2005) conducted archaeological testing for the proposed Confluence Project Land Bridge in 2004. Shovel probes were excavated at a 20 m interval northeast of SR 14 right-of-way. Probes closest to the CRC APE (P01 through P06) yielded the greatest concentration of mostly 20th-century historical artifacts to a depth of 60 cm. Shovel probe P04, located on a raised berm associated with a historical road, contained the highest density of artifacts; P04 and P06 contained architectural debris probably from the demolition of early-to-mid 20th-century structures that were located in this area (Wilson 2005:20). No significant cultural deposits were indentified.

ST01, ST02, and ST03 investigated the area of a ca. 1928, 5 x 8 m concrete foundation slab. ST06, ST07, and ST08, were excavated within the WSDOT right-of-way northeast of SR 14 in VNHR Area #4 within the current CRC APE. The upper sediments contained large amounts of construction and demolition debris. The more intact mid-20th-century sediments contained an abundance of coal from a storage facility that had been located in this area (Wilson 2005:23). Artifacts reflected a mixed 19th- and 20th-century context to a depth of 60 cm in ST06, 20 cm in ST07, and 30 cm in ST08. No significant cultural deposits were indentified.

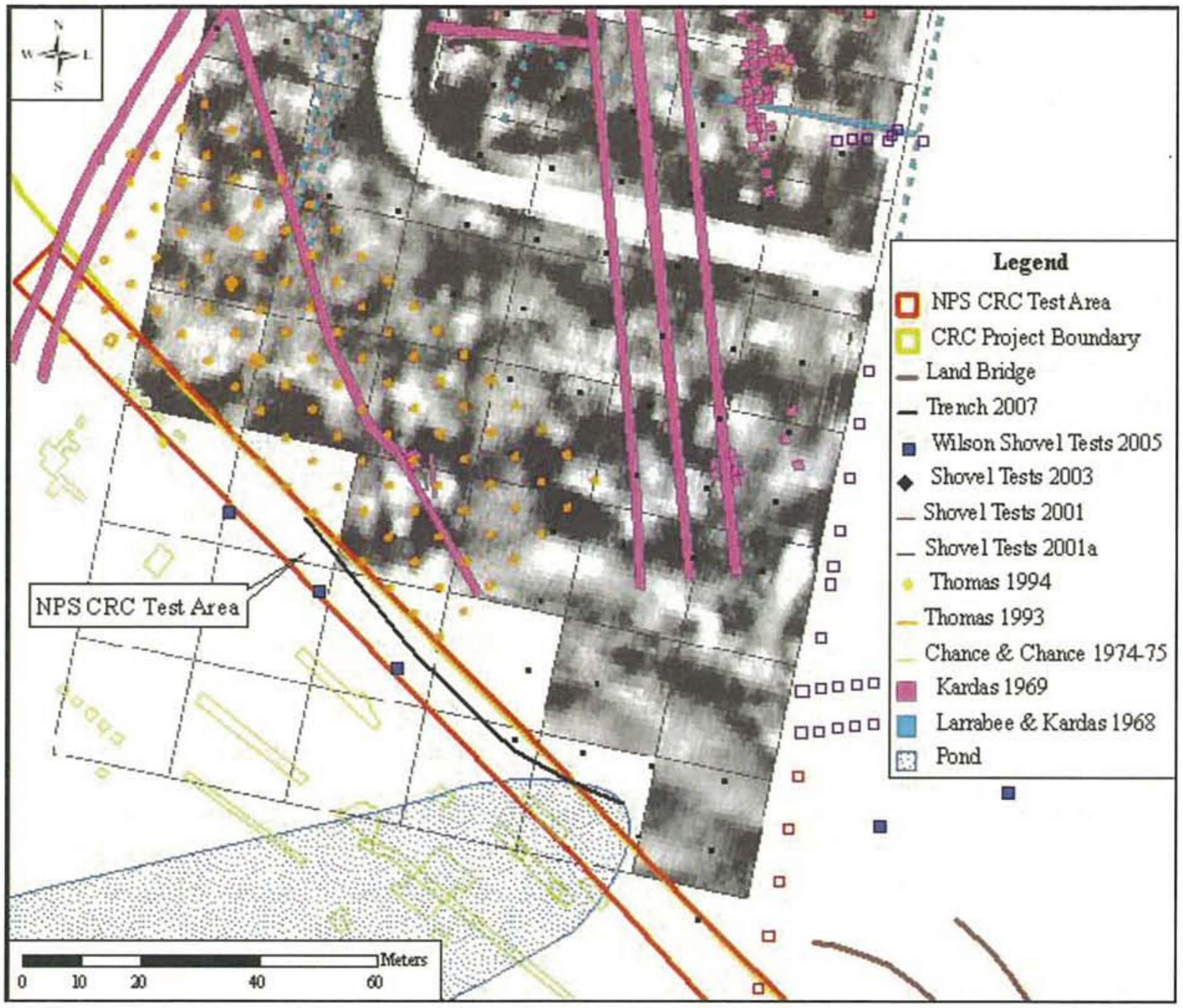

FIGURE 122. Resistivity map of the HBC Village by Kvamme (2003). (NPS 2010)

During the final landscaping for the Confluence Project Land Bridge in 2007, workers dug a trench for irrigation that was not authorized by NPS archaeologists. The trench was dug with a ditch witch, and was approximately 75 m long, 60 cm wide at the top, 30 cm wide at the bottom, and 40 cm deep. Cultural resources observed consisted of 20th-century material on the east end of the trench, and two separate intact mid-19th-century deposits at a depth of approximately 20 cm in the middle and west portions of the trench. These two deposits appear to be in the same location as concentrations of 19th-century artifacts recorded in 1993 by Thomas (1993:15). Coal was also observed in the middle and western portions of the trench, undoubtedly from a storage facility that had been located in this area. Artifacts were collected, profiles of the trench were drawn, and the report is in progress.

METHODS

The National Park Service conducted archival research, remote sensing surveys, and archaeological test excavations within the CRC APE in VNHR Area #4 on NPS property in the southwest portion of the Fort Vancouver Village to identify archaeological resources that may be adversely affected by the CRC project.

Geophysical Surveys

Remote-sensing surveys were conducted within a single survey grid in VNHR Area #4. The magnetometer survey was conducted on January 29, 2009 by Kendal McDonald of Z-Too Archaeogeophysical Prospection (Figure 123). The ground penetrating radar survey was conducted on February 19, 2009 by Steve De Vore of the NPS Midwest Archaeological Center (Figure 124).

Archaeological Test Excavations

The NPS conducted subsurface testing within VNHR Area #4 to target anomalies seen on the geophysical surveys, in areas of possible historical buildings and features seen on historical maps and documents, to answer the questions outlined in the Project Goals section, and at regular intervals throughout the project area. Anticipated findings in this area consisted primarily of archaeological deposits associated with HBC Village houses, roads, and the pond. Because the quantity and location of Village structures changed during the period of HBC occupation, as well as seasonally (Figure 3), all areas of the Village have the potential to contain intact archaeological deposits associated with these buildings. House 4/4B was located near the present SR 14 right-of-way fence and is the known structure most threatened by construction activities associated with the CRC project. These deposits lie very close to the surface within the CRC APE in the Village. All units in this area were excavated by hand.

FIGURE 123. Kendal McDonald conducting the magnetometer survey of the HBC Village with the assistance of Heidi Pierson, facing southeast. (NPS 09-01:1623, 1/29/09)

FIGURE 124. Steve De Vore conducting the GPR survey of the HBC Village with the assistance of Eric Gleason and Leslie O'Rourke, facing west. (NPS 09-06:1566, 2/19/09)

EXCAVATION RESULTS

From March 10-27, 2009, the NPS conducted archaeological testing in VNHR Area #4 on NPS property within the HBC Village (Figure 125). The project area was located within 15 m (50 ft.) of the SR 14 right-of-way fence, paralleling the fence for 140 m (460 ft.) from the U.S. Army property chain link fence on the northwest to the Land Bridge plantings on the southeast.

Eleven TUs (TU4-01 through TU4-11) totaling 11.0 m^2 were excavated in the CRC APE in the Village (Figure 126, Table 24). TUs were oriented to grid north, which was 44° east of true north. Three features (Features 2-4) were recorded within TU4-05, TU4-07, and TU4-08 in the Village. Five STs (ST 4-01 through ST4-05) totaling 1.25 m^2, oriented to true north, were excavated between the Land Bridge plantings and the SR 14 right-of-way fence in an area where impacts from the project were uncertain because of proximity to the Land Bridge and its accompanying landscaping.

Intact sediments were observed in the middle of VNHR Area #4, where the sod and a thin fill layer rested directly on intact HBC Village Stratum III A-horizon deposits. Some mixing of U.S. Army and earlier HBC material, at least in part due to bioturbation, was observed in the fill and the upper portion of Stratum III. Units in the western quarter of this area showed some disturbance and fill associated with the railroad spur and U.S. Army coal storage pad. The southeastern part of this area showed some disturbance and fill from previous highway construction. An example of the stratigraphic sequence in this area is described below for TU4-04 (Figure 127).

FIGURE 125. Area of NPS archaeological testing in VNHR Area #4 in the HBC Village, facing north. (NPS 09-06:1602, 3/27/09)

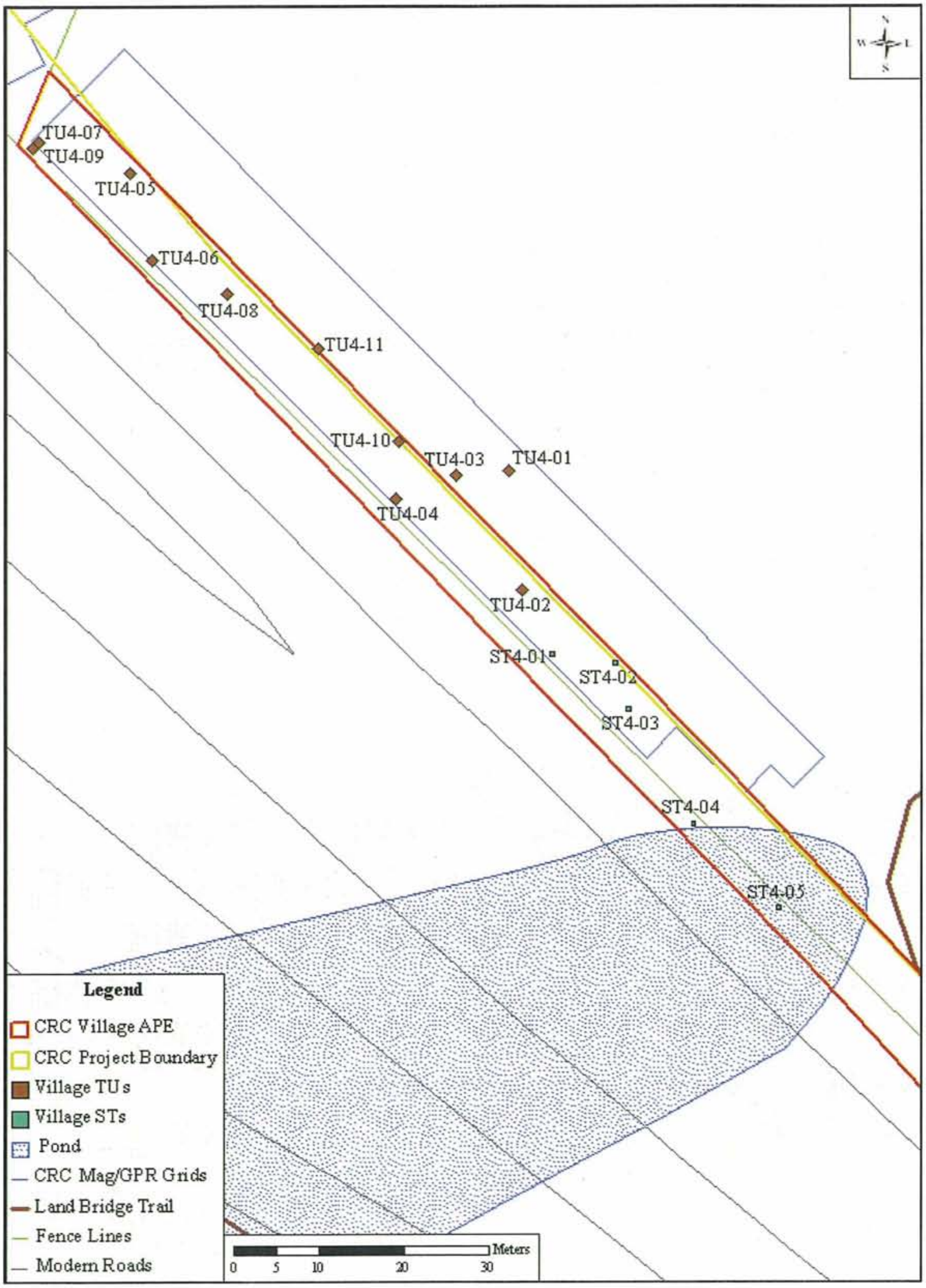

FIGURE 126. TUs (TU4-01 through TU4-11) and STs (ST4-01 through ST4-05) in VNHR Area #4. (NPS 2010)

TABLE 24
ARCHAEOLOGICAL TEST UNITS AND SHOVEL TESTS WITHIN VNHR AREA #4

Unit	Maximum Depth (cm)	Findings
TU4-01	57	House 4/4B
TU4-02	60	House 4/4B
TU4-03	57	House 4/4B
TU4-04	50	House 4/4B
TU4-05	50	disturbed, Feature 2 asphalt layer
TU4-06	50	disturbed
TU4-07	50	disturbed, Feature 3 rodent burrow
TU4-08	50	disturbed, Feature 4 flood silts
TU4-09	50	disturbed, Feature 3 rodent burrow
TU4-10	57	House 4/4B
TU4-11	51	House 4/4B
ST4-01	80	disturbed
ST4-02	80	disturbed
ST4-03	80	disturbed
ST4-04	90	Pond
ST4-05	80	Pond

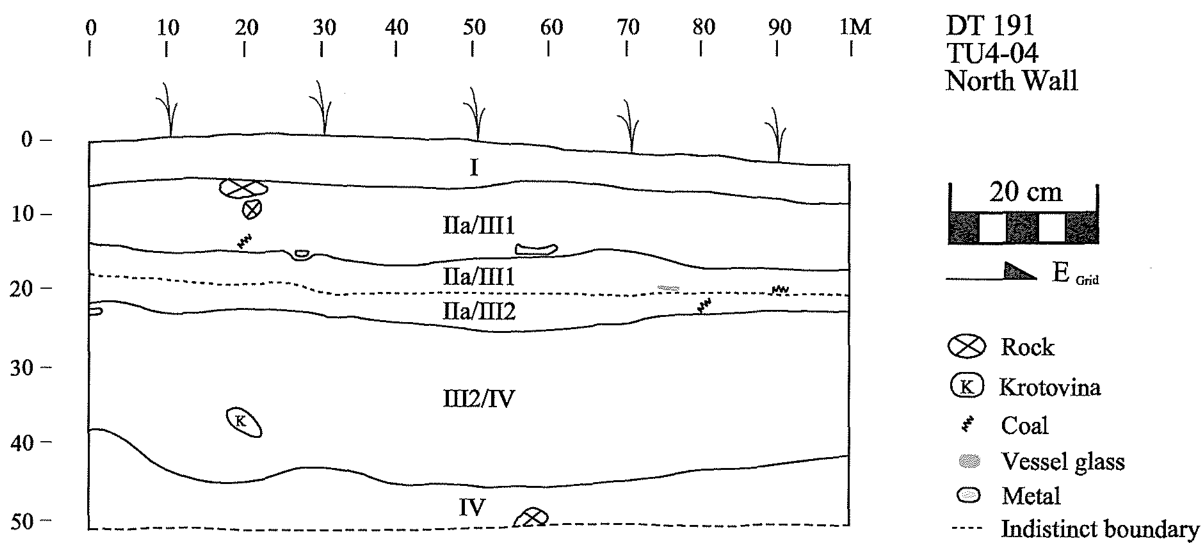

FIGURE 127. North wall profile of TU4-04 in VNHR Area #4. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR2/2 very dark brown silt loam, dense grass roots, modern debris.
Stratum IIa:	10YR3/2 very dark grayish brown silt loam, 50% gravels decreasing with depth, low density of mixed U.S. Army and HBC artifacts.
Stratum III1:	10YR3/2 very dark grayish brown silt loam, 30% gravels, high density of mixed 19th-century U.S. Army and HBC artifacts.
Stratum III2:	10YR3/2 very dark grayish brown to 10YR4/2 dark grayish brown silt loam, 20% gravels, high density of 19th-century HBC artifacts.
Stratum IV:	B horizon, 10YR4/3 brown gravelly silt loam, culturally sterile.

Village Test Units
Data on the volume of sediments excavated and the number of artifacts recovered from the TUs in VNHR Area #4 are presented in Table 25.

TU4-01
This unit was located near the estimated location of House 4 in an area where rodent activity had brought an abundance of HBC-era cultural material to the surface. A very dense intact deposit of HBC artifacts (mixed with some U.S. Army material within the sod) began at the ground surface and extended to about 25 cm below surface. Level 3 from 15-20 cm contained more than 1200 artifacts (Figure 128). Artifact density dropped off sharply at the B-horizon transition at 35 cm; the unit was terminated at 57 cm. These deposits may be associated with House 4 to the north, or may be indicative of another Village house (House 4B in the Fort Vancouver National Historic Site Village Development Concept Plan).

TU4-02
This unit was placed to investigate HBC-era cultural material seen in a nearby trench inadvertently dug during the landscaping for the Land Bridge project in 2002. Deposits in this unit are largely intact, although HBC/U.S. Army deposits in the upper strata were disturbed by bioturbation. An intact HBC surface was present from about 15-30 cm below surface, containing a very large number of 19th-century artifacts. B-horizon deposits began at 30 cm; the unit was terminated at 60 cm.

TU4-03
This unit was placed to evaluate the extent of the House 4 deposits seen in TU4-01. HBC/U.S. Army deposits in the upper strata were disturbed by bioturbation. An intact HBC house, house yard, or sheet trash surface was located from about 15-35 cm below surface, containing a very large number of 19th-century artifacts. B-horizon deposits were reached at 35 cm; the unit was terminated at 57 cm. Artifact counts were not as high as in TU4-01.

TU4-04
This unit was placed to evaluate the extent of the House 4 deposits seen in TU4-01. The intact buried HBC cultural layer contained a very large number of 19th-century artifacts that were very fragmented. B-horizon deposits were reached at 30 cm; the unit was terminated at 50 cm. This unit appears to be on the outer edge of the house and house yard deposits related to House 4/4B.

TABLE 25
EXCAVATION RESULTS FOR VNHR AREA #4 TUs

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU4-01									
1	0-7	0.0700	295	4214	94	29	42	39	15
2	7-14	0.0675	563	8341	195	83	103	91	29
3	14-18	0.0425	1238	29129	353	221	152	174	57
4	18-23	0.0500	539	10780	162	58	72	68	28
5	23-33	0.1025	20	195	9	2	3	5	-
6	33-43	0.1000	18	180	6	3	-	-	-
7	43-54	0.1125	2	18	2	-	-	-	-
Total		0.5450	2675	4908	821	396	372	377	129
TU4-02									
1	0-8	0.0800	18	225	3	4	3	3	2
2	8-18	0.0975	356	3651	62	62	137	36	17
3	18-25	0.0725	131	1807	23	22	53	13	4
4	25-36	0.1075	14	130	-	2	-	1	-
5	36-46	0.1025	-	-	-	-	-	-	-
6	46-56	0.0975	-	-	-	-	-	-	-
Total		0.5575	519	931	88	90	193	53	23
TU4-03									
1	0-6	0.0625	24	384	7	4	4	4	-
2	6-13	0.0700	244	3486	26	11	42	11	-
3	13-17	0.0375	194	5173	46	17	54	18	6
4	17-25	0.0775	609	7858	144	32	210	51	35
5	25-35	0.1000	13	130	6	2	1	-	-
6	35-47	0.1150	10	87	5	1	2	-	-
7	47-56	0.0900	-	-	-	-	-	-	-
Total		0.5525	1094	1980	234	67	313	84	41
TU4-04									
1	0-7	0.0725	16	221	3	-	8	1	-
2	7-13	0.0575	202	3513	11	6	8	20	5
3	13-19	0.0600	169	2817	22	8	22	24	5
4	19-21	0.0200	169	8450	21	2	32	2	5
5	21-28	0.0725	143	1972	57	7	51	7	3
6	28-38	0.0950	4	42	-	-	-	-	-
7	38-49	0.1050	-	-	-	-	-	-	-
Total		0.4825	703	1457	114	23	121	54	18

Continued on next page

TABLE 25
EXCAVATION RESULTS FOR VNHR AREA #4 TUs (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU4-05									
1	0-7	0.0325	2	62	-	1	1	-	-
2	7-19	0.0600	38	633	2	2	3	2	1
F2, L1	9-15	0.0725	1	14	1	-	1	-	-
3	19-34	0.0975	1	10	1	-	-	-	-
4	34-44	0.0850	1	12	-	-	-	-	-
5	44-54	0.0850	-	-	-	-	-	-	-
Total		0.4325	43	99	4	3	5	2	1
TU4-06									
1	0-7	0.0650	10	154	-	-	5	2	-
2	7-18	0.1075	525	4884	-	-	9	8	-
3	18-28	0.0975	16	164	-	1	1	-	-
4	28-38	0.1025	8	78	-	-	-	-	-
5	38-48	0.1000	1	10	-	-	-	-	-
Total		0.4725	560	1185	-	1	15	10	-
TU4-07									
1	0-8	0.0825	56	679	2	-	4	3	-
2	8-19	0.1075	33	307	5	-	14	6	-
3	19-30	0.1125	44	391	3	-	9	-	1
4	30-38	0.0630	19	302	2	-	1	-	1
F3, L1	30-40	0.0100	6	600	1	-	-	-	-
5	38-46	0.0690	5	72	-	-	2	-	-
F3, L2	40-50	0.0080	7	875	-	-	-	-	-
F3, L3	50-71	0.0168	4	238	-	-	-	1	-
Total		0.4693	174	371	13	-	30	10	2
TU4-08									
1	0-5	0.0475	64	1347	1	1	4	-	-
2	5-14	0.0850	167	1965	4	-	44	5	1
3	14-23	0.0900	138	1533	6	1	11	2	-
F4, L1	20-25	0.0185	1	54	-	-	-	-	-
4	23-34	0.0662	13	197	1	1	4	-	-
5	34-45	0.1125	13	116	-	-	-	-	-
6	45-54	0.0925	2	22	-	-	-	-	-
Total		0.5122	398	777	12	3	63	7	1

Continued on next page

TABLE 25
EXCAVATION RESULTS FOR VNHR AREA #4 TUs (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU4-09									
1	0-4	0.0400	45	1125	4	1	5	-	-
2	4-18	0.1375	1058	7695	8	6	25	10	-
3	18-28	0.1000	87	870	3	1	25	4	-
4	28-38	0.0470	2	43	-	-	15	-	-
F3, L1	30-40	0.0530	42	792	2	3	-	1	-
5	38-48	0.0840	21	250	-	-	2	-	1
F3, L2	40-50	0.0160	8	500	2	1	-	-	1
F3, L3	50-60	0.0160	12	750	4	1	3	-	-
Total		0.4935	1275	2584	23	13	75	15	2
TU4-10									
1	0-5	0.0475	16	337	-	3	5	2	-
2	5-15	0.1025	329	3210	12	-	7	2	1
3	15-17	0.0150	34	2267	8	1	7	10	2
4	17-25	0.0825	201	2436	39	10	81	10	5
5	25-36	0.1075	15	140	3	1	2	-	1
6	36-45	0.0875	4	46	-	-	-	-	-
7	45-56	0.1100	1	9	-	-	-	-	-
Total		0.5525	600	1086	62	15	102	24	9
TU4-11									
1	0-10	0.0950	77	811	4	2	6	-	-
2	10-20	0.0975	616	6318	22	-	74	6	2
3	20-27	0.0675	148	2193	5	-	99	-	-
4	27-40	0.1275	8	63	1	-	-	-	-
5	40-50	0.0975	1	10	-	-	-	-	-
Total		0.4850	850	1753	32	2	179	6	2
GRAND TOTAL		**5.555**	**8891**	**1601**	**1403**	**613**	**1468**	**642**	**17**

*Personal and domestic items

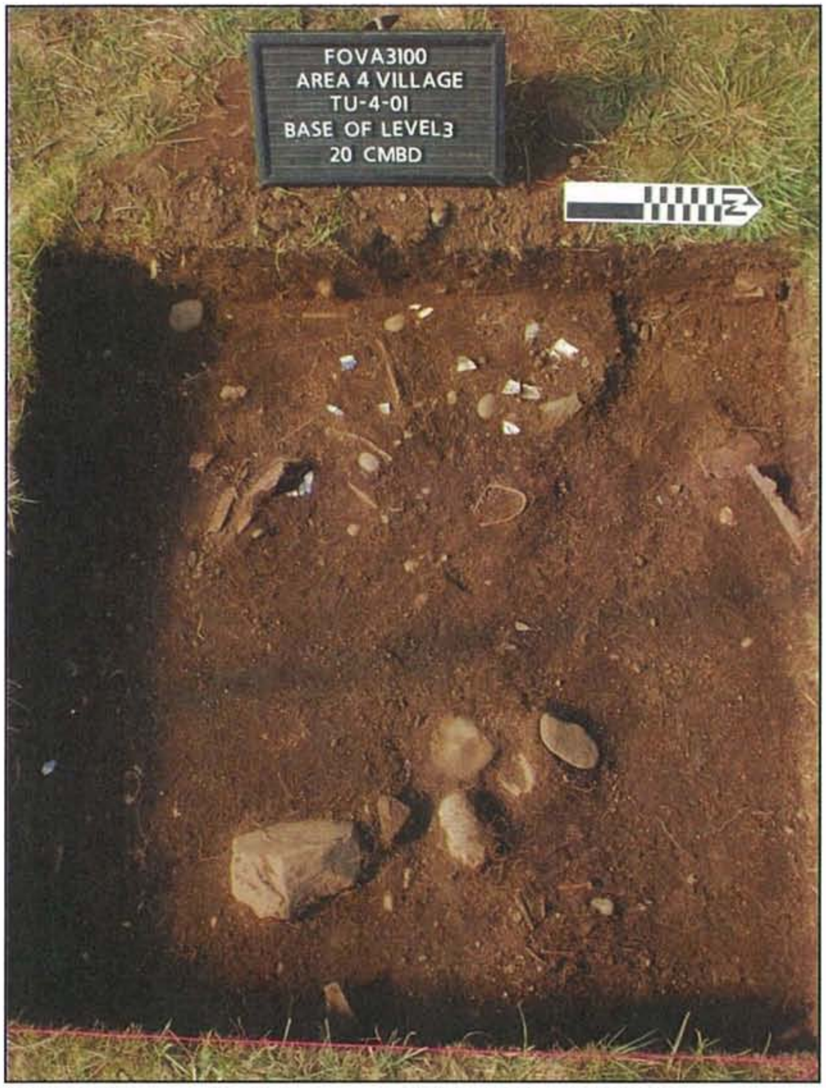

FIGURE 128. TU4-01 Stratum III, facing west. (NPS 09-06:40 3/10/09)

TU4-05

This unit was placed to investigate a possible structure shown on historical maps and a GPR anomaly. Stratum III was largely missing. HBC deposits were missing or mixed with U.S. Army material. B-horizon deposits were reached beginning at 20 cm; the unit was terminated at 50 cm. Feature 2, an asphalt layer observed by Thomas and Hibbs (1984), was intrusive into Stratum IV.

TU4-06

This unit was located in the area of the 1974 Chance and Chance Operation 25. Stratum III was largely missing, presumably removed by U.S. Army or road construction activities. HBC deposits were missing or mixed with U.S. Army material. B-horizon deposits were reached at 20 cm; the unit was terminated at 50 cm. The Operation 25 excavations were not relocated.

TU4-07

This unit was placed to investigate the western boundary of the project area and a possible structure indicated by historical maps. Subsurface asphalt (as seen in TU4-05) was throughout much of this area, so this unit was located in a clear area. Sediments were disturbed through this unit. A coal layer was discovered from about 10-20 cm below surface at the south end of TU4-07 extending into TU4-09. B-horizon deposits were reached at 30 cm; the unit was terminated at 50 cm. Feature 3 in the southwest corner of the unit appeared to be a pit feature, but was later determined to be due to rodent activity.

TU4-08

This unit was located to investigate a magnetic anomaly. The anomaly proved to be a metal rod with two pulleys located just below the sod, probably associated with the railroad. A-horizon deposits were seen below disturbed fill, beginning at 30 cm. The unit was terminated at the beginning of the B horizon at 50 cm. A silt lens (Feature 4) presumably associated with one of the many Columbia River floods, was present in the northeast corner of the unit at about 20 cm above the B horizon.

TU4-09

TU4-09 was excavated adjacent to and south of TU4-07 to further investigate Feature 3. Sediments were mostly disturbed – possibly from the extensive rodent burrows seen throughout these two units. The unit was terminated at the beginning of B-horizon deposits at 50 cm. A rebar stake was discovered in the south end of the unit. This rebar was confirmed to be the 20E/20N point of the Thomas (1993) grid. Magnetic anomalies from the rebar marking Thomas' probes were seen at 20-foot intervals throughout this portion of the Village. It was easy to locate any probe on his grid by measuring from the 20E/20N corner stake. The top of each rebar stake was marked with a metal tag and flagging tape within a few cm of the surface.

TU4-10

This unit was positioned to investigate a broad linear magnetic anomaly. Intact sediments from the late U.S. Army, early U.S. Army, and HBC were observed in discrete lenses in the A horizon to 25 cm below surface. B-horizon deposits were reached at 36 cm; the unit was terminated at 57 cm. HBC-era artifact density was moderate, possibly representing House 4/4B or a Village activity area. The nature of the magnetic anomaly was not determined.

TU4-11

This unit was excavated in the area between TU4-08 and TU4-10 to try to determine the extent of intact HBC deposits. No undisturbed HBC deposits were found in this unit, indicating that the western edge of the intact HBC surface may lie between this unit and TU4-10. The upper levels consisted of mixed HBC/U.S. Army material in fill, with Stratum III largely missing or disturbed by bioturbation. B-horizon deposits were reached at 40 cm; the unit was terminated at 51 cm.

Village Shovel Tests

Data on the volume of sediments excavated and the number of artifacts recovered from the STs in VNHR Area #4 are presented in Table 26.

<u>ST4-01</u>

No intact cultural deposits were found in this shovel test unit. Mixed 19th- and 20th-century material was found to at least 70 cm below surface. This area was likely disturbed during one of the many phases of SR14 highway construction.

<u>ST4-02</u>

This ST was similar to ST4-01. The transition to the C horizon was seen at 80 cm below surface.

<u>ST4-03</u>

No intact cultural deposits were found in this shovel test unit. Modern fill deposits were seen to 38 cm below surface, with mixed 19th- and 20th-century material to at least 60 cm. This area was likely disturbed during one of the many phases of SR14 highway construction.

<u>ST4-04</u>

This shovel test was located between the Land Bridge plantings and the SR14 right-of-way fence, 11 m east of the southeast corner of the remote sensing grid (Figure 129). This unit may be within the area of the historic pond. Artifact-rich fill deposits consisting of mixed 19th- and 20th-century material, extended to at least 70 cm below surface. The fill below 70 cm contained mostly historical artifacts. The bottom of the fill deposits was not reached.

FIGURE 129. Cheryl Paddock and Jacqueline Cheung excavating ST5-05, and Ben Diaz and Leslie O'Rourke excavating ST4-04, facing west. (NPS 09-06:1599, 3/27/09)

TABLE 26
EXCAVATION RESULTS FOR VNHR AREA #4 STs

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19^{th}-c. Artifacts*
ST4-01									
1	0-10	0.025	3	120	-	-	1	1	-
2	10-20	0.025	1	40	-	-	1	-	-
3	20-30	0.025	2	80	-	-	-	-	-
4	30-40	0.025	22	880	-	2	6	-	1
5	40-50	0.025	6	240	-	1	4	-	-
6	50-60	0.025	2	80	-	-	-	-	-
7	60-70	0.025	2	80	1	-	-	-	-
8	70-80	0.025	3	120	-	-	-	2	-
Total		0.200	41	205	1	3	12	3	1
ST4-02									
1	0-10	0.025	-	-	-	-	-	-	-
2	10-20	0.025	28	1120	-	1	1	-	-
3	20-30	0.025	31	1240	1	-	6	-	-
4	30-40	0.025	51	2040	-	3	2	1	-
5	40-50	0.025	71	2840	-	-	1	-	-
6	50-60	0.025	80	3200	1	2	1	2	-
7	60-70	0.025	13	520	-	-	-	9	-
8	70-80	0.025	20	800	-	2	-	3	-
Total		0.200	294	1470	2	8	11	15	-
ST4-03									
1	0-10	0.025	4	160	-	1	-	-	-
2	10-20	0.025	3	120	1	-	2	-	-
3	20-30	0.025	2	80	1	1	-	-	-
4	30-40	0.025	115	4600	-	4	6	3	-
5	40-50	0.025	7	280	-	2	2	-	-
6	50-60	0.025	5	200	1	-	-	-	-
7	60-70	0.025	-	-	-	-	-	-	-
8	70-80	0.025	-	-	-	-	-	-	-
Total		0.200	136	680	3	8	10	3	-

Continued on next page

TABLE 26
EXCAVATION RESULTS FOR VNHR AREA #4 STs (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
ST4-04									
1	0-10	0.025	11	440	1	-	1	1	-
2	10-20	0.025	1	40	-	-	-	-	-
3	20-30	0.025	28	1120	4	4	11	2	1
4	30-40	0.025	20	800	4	2	8	5	-
5	40-50	0.025	32	1280	4	8	8	8	1
6	50-60	0.025	41	1640	6	11	17	5	1
7	60-70	0.025	12	480	-	2	7	2	1
8	70-80	0.025	78	3120	3	6	26	9	3
9	80-90	0.025	73	2920	19	11	13	7	6
Total		0.225	296	1316	41	44	91	39	13
ST4-05									
1	0-10	0.025	58	2320	-	-	-	-	-
2	10-20	0.025	114	4560	-	-	7	-	1
3	20-30	0.025	11	440	-	-	2	2	-
4	30-40	0.025	8	320	-	2	1	2	-
5	40-50	0.025	26	1040	-	-	-	1	-
6	50-60	0.025	2	80	1	1	-	-	-
7	60-70	0.025	7	280	-	1	-	-	-
8	70-80	0.025	11	440	-	-	-	-	-
Total		0.200	237	1185	1	4	10	5	1
GRAND TOTAL		**1.025**	**1004**	**980**	**48**	**67**	**134**	**65**	**15**

*Personal and domestic items

ST4-05

This shovel test was located between the Land Bridge plantings and the SR14 right-of-way fence, 25 m east of the southeast corner of the remote sensing grid. This unit may be within the historic pond. Fill deposits consisting of mixed 19th- and 20th-century material extended to at least 80 cm below surface. The bottom of the fill deposits was not reached.

ANALYSIS RESULTS

Through the review of historical documents and maps, previous archaeological studies, the Fort Vancouver National Historic Site GIS database, and the results of geophysical surveys and archaeological field investigations, two cultural resources were identified within the HBC Village VNHR Area #4 within the CRC APE: 1840s House 4/4B and HBC Pond. No other significant resources were located, although undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to 19th-century structures, may still exist in VNHR Area #4 within the CRC APE.

Village TUs

1840s House 4/4B

Archaeological deposits from the 1840s House 4/4B, located within the HBC Village west of the stockaded Fort Vancouver, were encountered in TU4-1, TU4-2, TU4-3, TU4-4, TU4-10, and TU4-11 in VNHR Area #4. Intact 19th-century deposits are located very close to the surface in this area (Figure 130). The high density of 19th-century domestic artifacts recovered from these units suggests that this was the location of a Village house, probably House 4 or House 4B.

The cultural material associated with these excavation units consists predominantly of 19th-century artifacts. A typological classification of these objects is presented in Table 27. Probable modern artifacts that are not included in Table 27 include asphalt, plastic, and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the House 4/4B TUs in the volumetrics table (Table 25), and the number of artifacts from these units in the typology table.

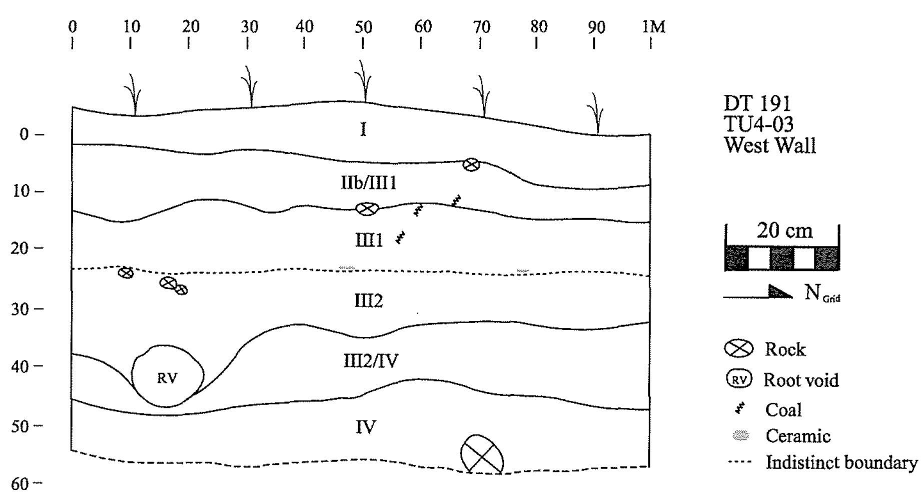

FIGURE 130. West wall profile of TU4-03, showing the 19th-century House 4/4B deposits and in situ artifacts. (NPS 2010)

TABLE 27
CHARACTERISTICS OF ARTIFACTS AT THE 1840s HOUSE 4/4B

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Button	I.A	3	0.04
Leather	I.A	3	0.04
Bead, Drawn	I.C	4	0.06
Bead, Wire Wound	I.C	2	0.03
Mirror Glass	I.D	1	0.01
Bottle, Alcohol	I.G	667	9.98
Bottle, Beer	I.G	30	0.45
Pipe, Tobacco	I.G	199	2.98
Fire Steel	I.G or I.J	1	0.01
Jaw Harp Frame	I.H	2	0.03
Metal Doll Plate Fragment	I.H	7	0.10
Total		**919**	**13.7%**
Domestic Items			
Iron Stove Part	II.B.1	1	0.01
Bone, Butchered	II.B.2	2	0.03
Bone, Unworked	II.B.2	305	4.56
Bottle, Food	II.B.2	34	0.51
Earthenware	II.B.2	640	9.58
Earthenware, Transferprinted	II.B.2	620	9.28
Ironstone	II.B.2	13	0.19
Porcelain	II.B.2	7	0.10
Stoneware	II.B.2	38	0.57
Tumbler	II.B.2	4	0.06
Lamp Glass	II.B.3	22	0.33
Metal Lock Bolt	II.B.3	1	0.01
Metal Lock Parts	II.C.8	7	0.10
Total		**1694**	**25.3%**
Architecture			
Brick	III.B.1	19	0.28
Flat Glass	III.B.1	592	8.86
Paint Chip	III.B.1	1	0.01
Tar Paper	III.B.1	1	0.01
Window Putty/Glaze	III.B.1	1	0.01
Wood, Unworked	III.B.1	2	0.03
Charcoal	III.B.1	6	0.09
Bolt	III.B.2	1	0.01
Metal Wire	III.B.2	20	0.30

Continued on next page

TABLE 27
CHARACTERISTICS OF ARTIFACTS AT THE 1840s HOUSE 4/4B (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Architecture (cont.)			
Nail, Machine-Cut	III.B.2	70	1.05
Nail, Machine-Cut American	III.B.2	96	1.44
Nail, Machine-Cut British	III.B.2	1	0.01
Nail, Square	III.B.2	185	2.77
Nail, Wire	III.B.2	140	2.10
Nail, Wrought	III.B.2	104	1.56
Screw	III.B.2	2	0.03
Sheet Metal	III.B.2	160	2.39
Tack, Square	III.B.2	2	0.03
Washer	III.B.2	9	0.13
Coal	III.E	1416	21.19
Slag	III.E	100	1.50
Total		**2928**	**43.8%**
Commerce and Industry			
Clay Pigeon	V.B	538	8.05
Cartridge	V.B or VI.B.4	1	0.01
Bottle, Medicine	V.J.6.b	6	0.09
Total		**545**	**8.2%**
Group Services			
Button, Military	VI.B.4	**1**	**0.01%**
Unknown			
Bisque	VIII	14	0.21
Seed	VIII	1	0.01
Slate	VIII	2	0.03
Brass Sheet	VIII.A	2	0.03
Copper Tube/Rod	VIII.A	1	0.01
Copper Wire	VIII.A	2	0.03
Lead Sprue	VIII.A	1	0.01
Metal Can Fragments	VIII.A	12	0.18
Metal D-ring	VIII.A	1	0.01
Unidentified Cupreous Artifact	VIII.A	1	0.01
Unidentified Iron Artifact	VIII.A	3	0.04
Unidentified Metal Artifact	VIII.A	16	0.24
Metal Disc	VIII.A	1	0.01
Metal Fragments	VIII.A	7	0.10
Metal Plate/Sheet	VIII.A	7	0.10
Metal Rod	VIII.A	1	0.01
Metal Rod with Nut	VIII.A	1	0.01

Continued on next page

TABLE 27
CHARACTERISTICS OF ARTIFACTS AT THE 1840s HOUSE 4/4B (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Unknown (cont.)			
Metal Strap	VIII.A	4	0.06
Lock Mechanism	VIII.A.1.a	1	0.01
Bottle Glass	VIII.B	80	1.20
Glass Sherd	VIII.B	437	6.54
Total		**595**	**8.9%**
GRAND TOTAL		**6682**	

More than 43% (n=2928) of the artifact assemblage in Table 27 consists of architectural material, predominantly flat glass (8.9%, n=592), all varieties of square nails (6.9%, n=458), metal sheet (2.4%, n=160), and wire nails (2.1%, n=140). Domestic items constitute over 25% (n=1694) of the assemblage, dominated by ceramics (19.7%, n=1318) and unworked bone (4.6%, n=305). Two pieces of bone with butchery marks are from a deer/sheep or larger-sized animal. The majority of personal items recovered (13.7%, n=919) are from alcohol bottles (10.4%, n=697) and tobacco pipes (3%, n=199) (Figure 131). The few fragments of tobacco pipes with makers' marks suggest that the pipes were primarily made by Thomas Balme, Ford Stepney, and William White. Other personal items include a strike-a light (Figure 132), buttons (Figure 133), beads (Figure 134), and fragments of jaw harps (Figure 135). Items recovered whose function could not be determined (8.9%, n=595) consist primarily of glass sherds and bottle glass.

The mean dates for the ceramic sherds recovered at House 4/4B (n=1318) show that the majority of these artifacts date from ca. 1845 (91.7%, n=1209) (Figure 136). Ceramics with a mean date of ca. 1845 are predominantly earthenware types (87.6%, n=1155), including white earthenware (43.2%, n=569) and transferprinted earthenware (39.1%, n=515), with lesser quantities of banded ware (n=29), yellow ware (n=15), lusterware (n=13), cottageware (n=9), mochaware (n=3), and pearlware (n=2). Other ceramic types with a mean date of ca. 1845 include English stoneware (n=35), ironstone (n=9), Chinese porcelain (n=4) (Figure 137), and English porcelain (n=3), and Chinese stoneware (n=3). Transferprinted earthenware sherds with an earlier mean ceramic date include 2 at ca. 1835, and 36 at ca. 1840. Transferprinted earthenware sherds with a later mean ceramic date include 55 at ca. 1850, and 12 at ca. 1855. Four ironstone sherds have a mean ceramic date of ca. 1870. The very strong primary mode at ca. 1845 is consistent with the HBC period at Fort Vancouver. The variety of ceramic types in this assemblage is similar to that found at Tayentas House.

FIGURE 131. Tobacco pipe fragments from TU4-01, Level 3, at House 4/4B in VNHR Area #4. (NPS 09-17:1250, 12/15/09)

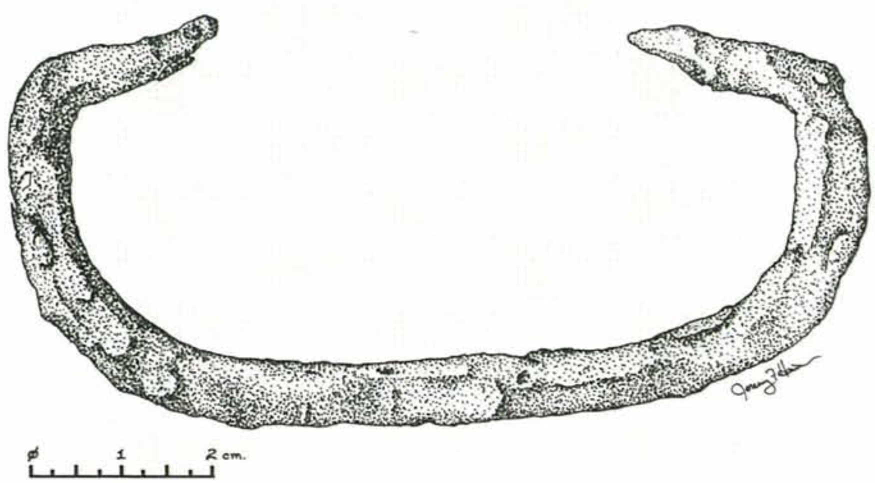

FIGURE 132. Strike-a-light from TU4-03, Level 3, at House 4/4B in VNHR Area #4. Illustration by Jeremy Harrison.

FIGURE 133. Ca. 1860 military button depicting the Great Seal of the United States from TU4-10, Level 2, at House 4/4B in VNHR Area #4. (10-01:16, 4/16/10)

FIGURE 134. Beads from House 4/4B TUs in VNHR Area #4. (09-17:1619, 12/17/09

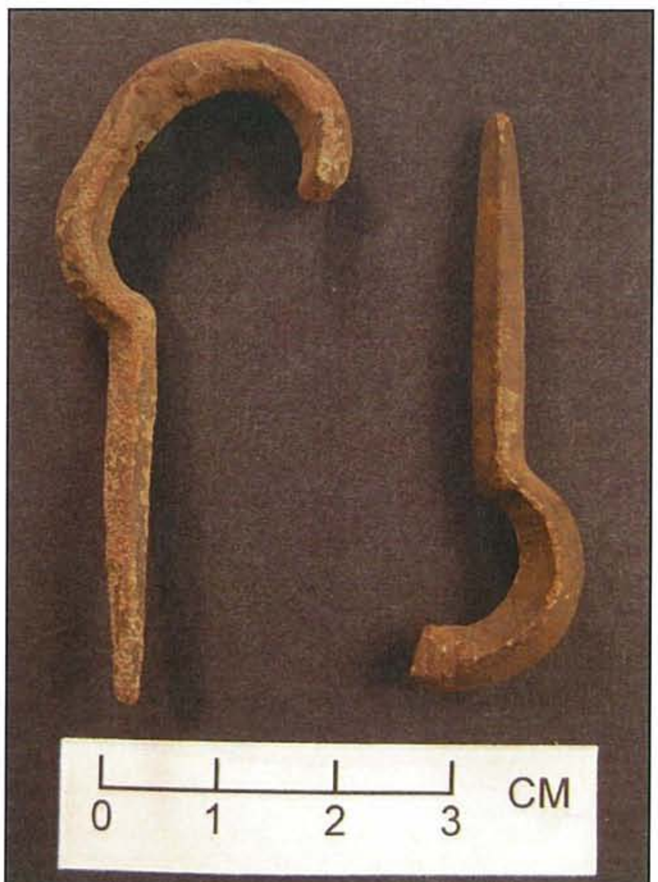

FIGURE 135. Jaw harp fragments from House 4/4B TUs in VNHR Area #4. (09-17:52, 12/17/09)

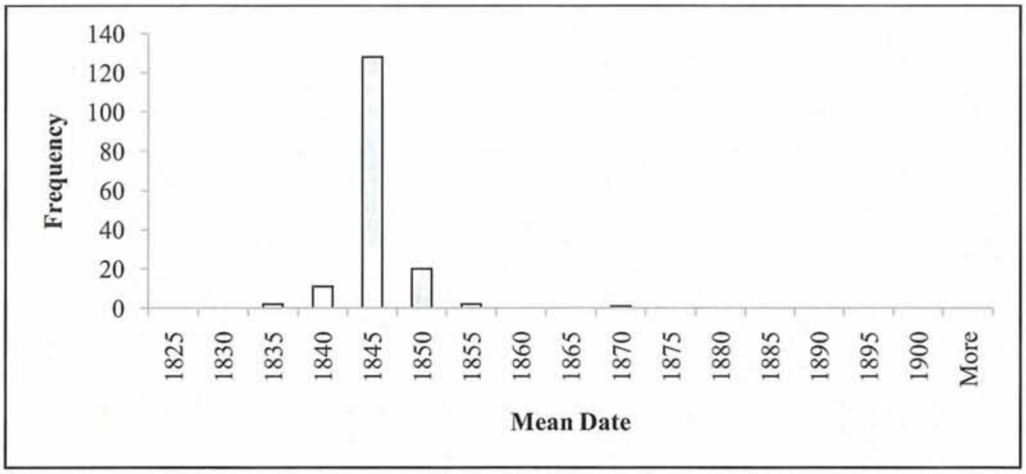

FIGURE 136. Mean ceramic dates for House 4/4B (σ=2.2). (NPS 2010)

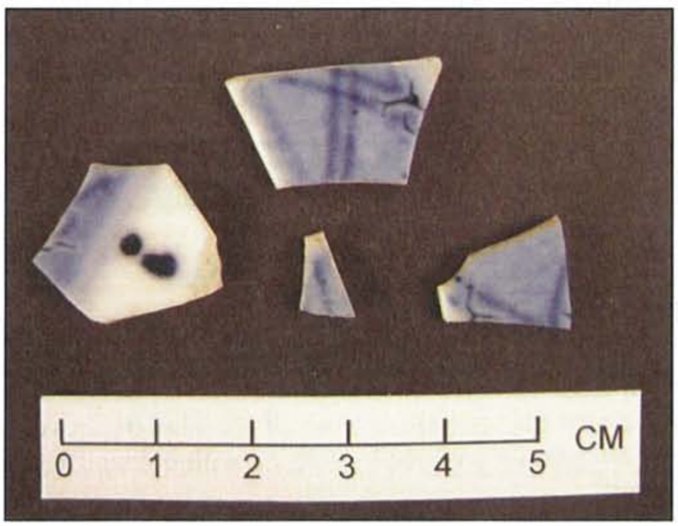

FIGURE 137. Chinese porcelain ceramic sherds from TU4-01, Levels 3-4 at House 4/4B in VNHR Area #4. (09-17:48, 12/17/09)

The manufacturer for the transferprinted earthenware is primarily W.T. Copeland or Copeland & Garrett. There is a very high diversity of transferprint patterns at House 4/4B. For example, more than two dozen patterns were identified among the 182 fragments in TU4-01, Level 3, including Aesop's Fables, Alhambra, Broseley, Byron Views, Camilla, Canova, Chinese Flowers, Fruit and Flowers, Italian, Lily, Pagoda, Ruins, Seasons, and Watteau (Figure 138). Some of the patterns had not been seen before in the HBC Village – still others remain unidentified.

FIGURE 138. Transferprinted earthenware ceramics from TU4-01, Level 3, at House 4/4B in VNHR Area #4. Sherds are loosely grouped by pattern, with unidentified fragments in the center. (NPS 09-17:203, 12/17/09)

The window glass thickness of the total number of fragments at the House 4/4B (n=593) has a primary mode of 0.055 in. (n=207), which corresponds to a date range of 1810-1845 (Figure 139). Taken together, the large number of glass fragments with a pre-1845 date range (a total of 397 fragments with a thickness mode of 0.055 in. or less, or 67% of all fragments) yields a very strong primary mode that is within the HBC occupation period at Fort Vancouver.

The majority of the total number of vessel glass fragments from House 4/4B (n=1280) show no temporally diagnostic attributes (74.4%, n=952). There is a large number of fragments made by methods that typically date from before 1900 (n=311, or 24.3% of all vessel glass fragments). Among these pre-1900 fragments, 305 fragments are from blown-into-mold vessels, and 6 fragments are from turn mold vessels. Seventeen fragments are from machine made vessels.

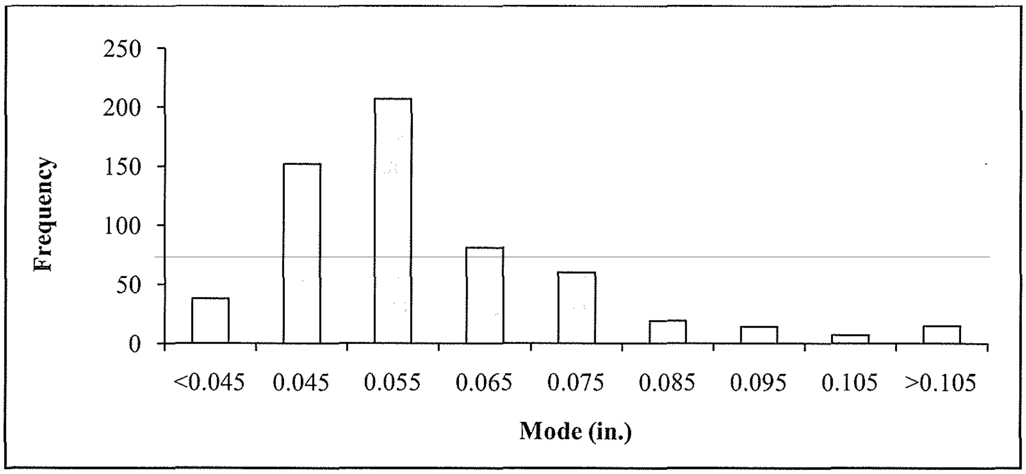

FIGURE 139. Window glass thickness at House 4/4B. (NPS 2010)

The assemblage of nails recovered at House 4/4B (n=598) has a strong bias toward the square types (Figure 140). The total number of all varieties of square nails (n=458) far outweighs the number of wire nails (n=140). The larger proportion of wire nails seen at House 4/4B than at the other two Village houses in VNHR Area #3 (Kanakas and Tayentas) is not surprising because of the mixed usage of the Village area by the HBC and the U.S. Army and the relatively undisturbed deposits in this area.

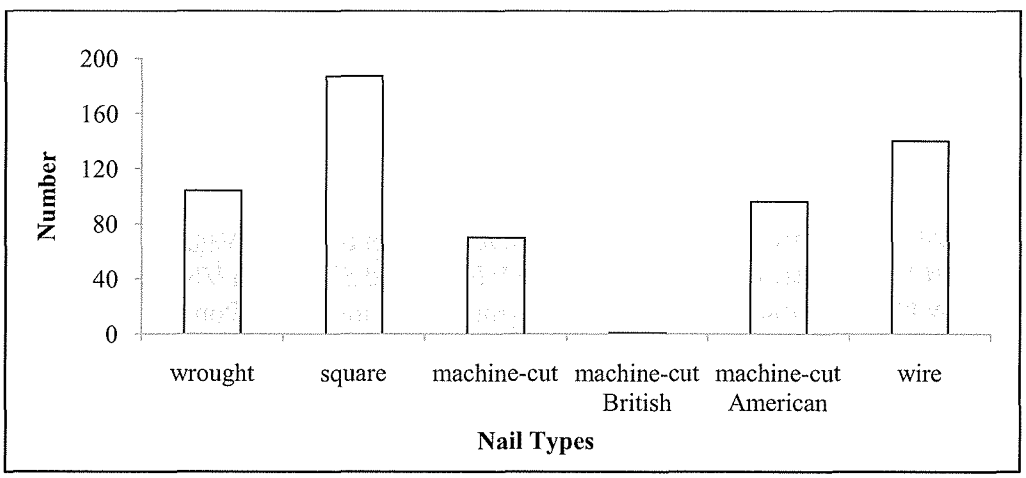

FIGURE 140. Nail types at House 4/4B. (NPS 2010)

The temporally diagnostic artifacts recovered from the 1840s House 4/4B excavation units (n=2835) consist mainly of 19th-century objects (94%, n=2658) (Figure 141). The quantity of predominantly 19th-century architectural material in the form of window glass and nails (36%, n=1029) suggests that this is the location of a Village structure. The moderate number of wire nails may be from U.S. Army use of the Village landscape. The abundance of 19th-century ceramic artifacts (19.7%, n=1318), along with the large quantity of other domestic and personal items (19.4%, n=1295), provides strong evidence that this is the location of a domestic structure. Historical maps and documents suggest that there were two Village houses next to each other in this location. Kardas (1970) referred to this area as House 4.

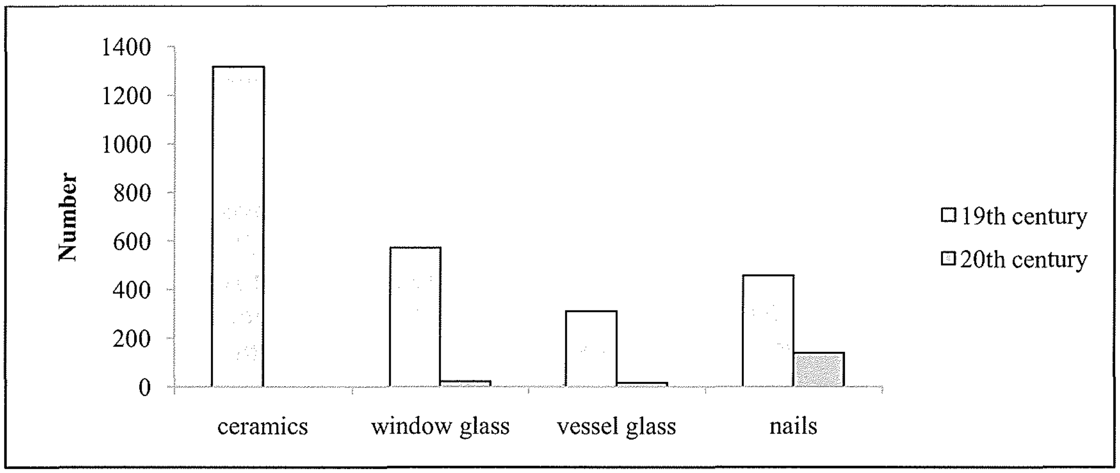

FIGURE 141. Distribution of temporally diagnostic artifacts at House 4/4B. (NPS 2010)

Village STs

HBC Pond

Archaeological deposits from the HBC Pond, located within the HBC Village west of the stockaded Fort Vancouver, were encountered in ST4-04 and ST4-05 in VNHR Area #4. From what we know from historical accounts and previous excavations, the Pond was used for refuse disposal by both the HBC and the U.S. Army. The artifacts recovered from the Pond units consist of a mix of 19th- and early 20th-century material. The bottom of the Pond deposits was not reached in the two STs. Chance and Chance (1976:28) speculated that the bottom of the Pond in 1825 was approximately 1.5 m below the ground surface in an area southwest of the SR 14 right-of-way fence.

A typological classification of these objects is presented in Table 28. Probable modern artifacts that are not included in Table 28 include paper, plastic, and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the Pond STs in the volumetrics table (Table 26), and the number of artifacts from these units in the typology table.

TABLE 28
CHARACTERISTICS OF ARTIFACTS AT THE POND

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Button, Back	I.A	1	0.19
Grommet/Clothing Snap	I.A	1	0.19
Leather	I.A	12	2.26
Snap	I.A	1	0.19
Buckle	I.A or VI.B.4	1	0.19
Bottle, Alcohol	I.G	8	1.51
Bottle, Beer	I.G	4	0.75
Pipe, Tobacco	I.G	7	1.32
Total		**35**	**6.6%**
Domestic Items			
Bone, Unworked	II.B.2	5	0.94
Earthenware	II.B.2	24	4.52
Earthenware, Transferprinted	II.B.2	9	1.69
Ironstone	II.B.2	1	0.19
Porcelain	II.B.2	6	1.13
Shell	II.B.2	9	1.69
Stoneware	II.B.2	2	0.38
Lamp Glass	II.B.3	2	0.38
Total		**58**	**10.9%**
Architecture			
Brick	III.B.1	7	1.32
Flat Glass	III.B.1	48	9.04
Slate	III.B.1	161	30.32
Wood Fragments	III.B.1	2	0.38
Nail, Machine-Cut	III.B.2	3	0.56
Nail, Square	III.B.2	12	2.26
Nail, Unidentified	III.B.2	2	0.38
Nail, Wire	III.B.2	27	5.08
Sheet Metal	III.B.2	18	3.39
Coal	III.E	31	5.84
Total		**311**	**58.6%**
Commerce and Industry			
Clay Pigeon	V.A	**5**	**0.9%**
Group Services			
Button, Military	VI.B.4	2	0.38
Sewer Tile	VI.E	4	0.75
Total		**6**	**1.1%**

Continued on next page

TABLE 28
CHARACTERISTICS OF ARTIFACTS AT THE POND (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Unknown			
Copper Wire	VIII.A	2	0.38
Unidentified Metal Artifact	VIII.A	26	4.90
Metal Strap	VIII.B	1	0.19
Bottle Glass	VIII.B	13	2.45
Glass Sherd	VIII.B	73	13.75
Laminated Glass	VIII.B	1	0.19
Total		**116**	**21.9%**
Grand Total		**531**	

More than 58% (n=311) of the artifact assemblage in Table 28 consists of architectural material, primarily slate (30.3%, n=161), window glass (9%, n=48), and all types of nails (8.3%, n=44). There are few domestic (10.9%, n=58) and personal (6.6%, n=35) items, A pair of military buttons was recovered with leather still attached (Figure 142). The items recovered whose function could not be determined (21.9%, n=116) consist mainly of glass sherds, unidentified metal artifacts, and bottle glass.

FIGURE 142. Pair of ca. 1860 military buttons depicting a variation of the Great Seal of the United States from ST4-04 at the Pond in VNHR Area #4. (NPS 10-01:64, 4/18/10)

The mean dates for the ceramic sherds recovered at the Pond (n=42) show that the majority of these artifacts date from ca. 1845 (n=39) (Figure 143). Ceramic types with a mean date of ca. 1845 include white earthenware (n=24), transferprinted earthenware (n=7), stoneware (n=2), Chinese porcelain (n=5), and English porcelain (n=1). One transferprinted earthenware sherd each has a mean ceramic date of ca. 1840 and ca. 1850. One ironstone sherd has a mean ceramic date of 1870. The strong primary mode at ca. 1845 is consistent with the HBC period at Fort Vancouver.

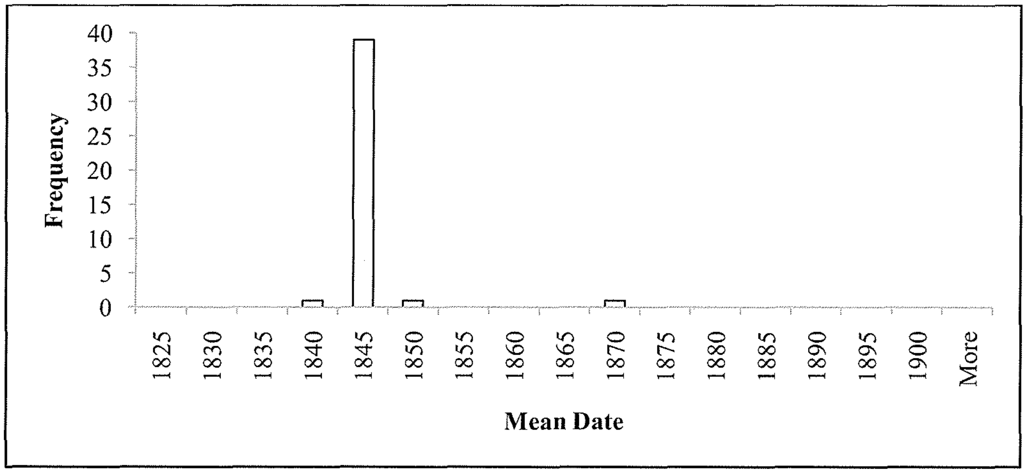

FIGURE 143. Mean ceramic dates at the Pond (σ=4.2). (NPS 2010)

The window glass thickness of the total number of fragments at the Pond (n=48) has a primary mode of 0.075 in. (n=12) corresponding to a date range of 1850-1865 (Figure 144). Taken together with the secondary overlapping mode at 0.085 in. (1855-1885), 48% of window glass fragments (n=21) date from the period that saw the departure of the HBC and the beginning of the U.S. Army occupation of the Village area.

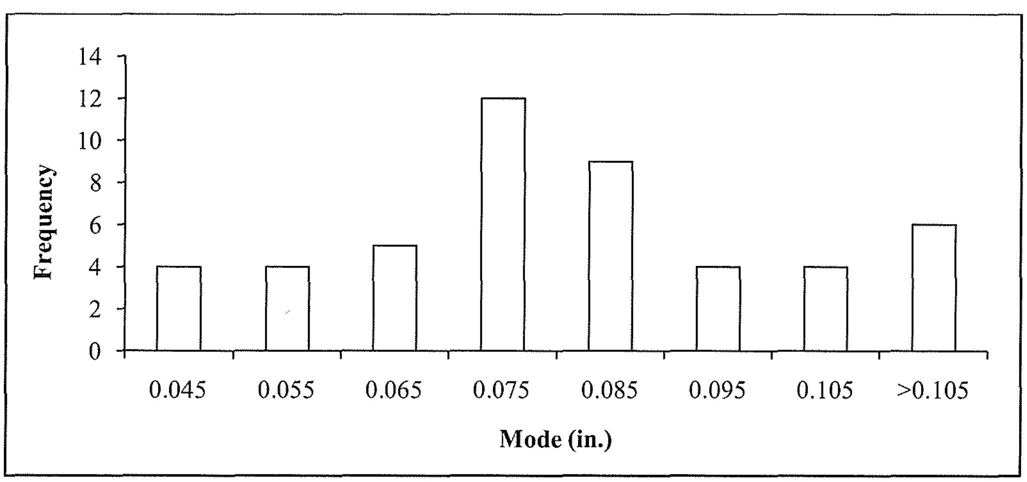

FIGURE 144. Window glass thickness at the Pond. (NPS 2010)

The majority of vessel glass fragments from the Pond (n=101) show no temporally diagnostic attributes (n=95). Six fragments are from blown-into-mold vessels. The assemblage of nails recovered in the Pond (n=44) favors wire nails (n=27) over square nails (n=17) (Figure 145). This is further evidence of the mixed HBC and U.S. Army era deposits present at the Pond.

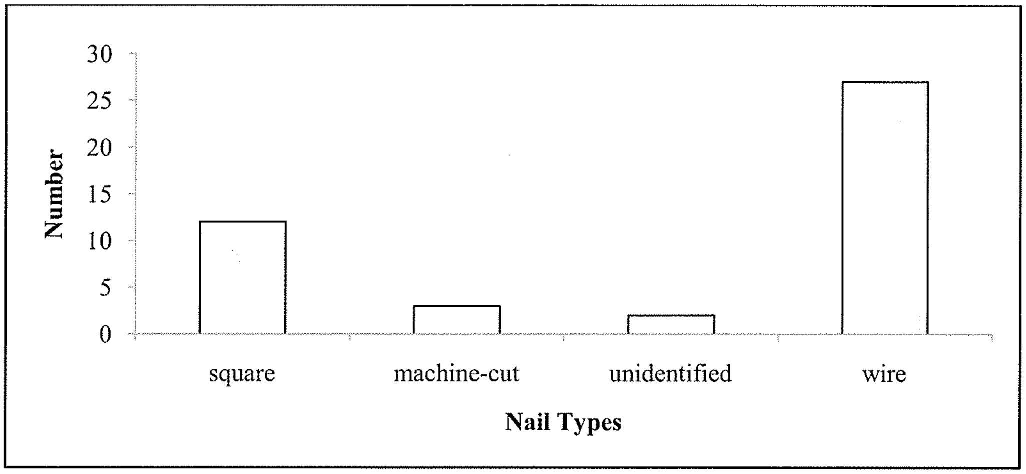

FIGURE 145. Nail types at the Pond. (NPS 2010)

In general, there are more temporally diagnostic artifacts from the Pond STs attributable to the 19th century (73.6%, n=103) than to the 20th century (26.4%, n=37) (Figure 146). The majority of artifacts recovered appear consistent with the accounts of the Pond being used as a trash dump. The relatively large number of ceramics and vessel glass present shows that domestic items were making their way into the Pond – either from the discard of broken vessels into the Pond as goods arrived at the HBC Fort Vancouver (as has been recorded), or during the demolition of Village structures and the filling in of the Pond by the U.S. Army in the late 19th century and early 20th century.

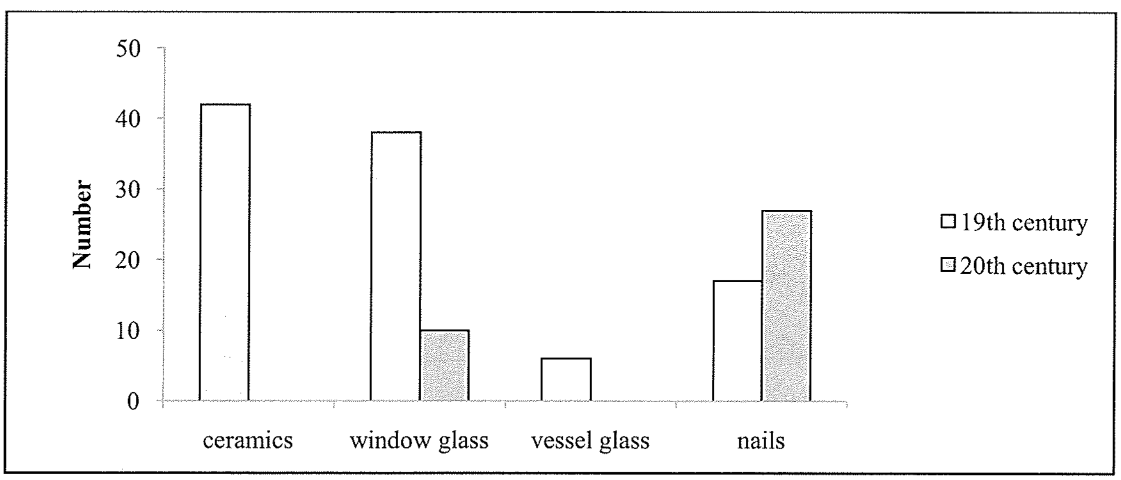

FIGURE 146. Distribution of temporally diagnostic artifacts at the Pond. (NPS 2010)

CONCLUSIONS AND RECOMMENDATIONS

Significant intact archaeological deposits related to the HBC Village are still present within VNHR Area #4 (HBC Village) within the CRC APE, and lie just below the surface to a depth of approximately 60 cm or less. Ground disturbance in this area has been minimal during the history of the occupation of Fort Vancouver – both by the HBC and the U.S. Army.

Archaeological resources that were tested that contribute to the significance of the VNHR District were observed in VNHR Area #4. Observations during test excavations strongly suggest that the 1840s Village House 4/4B contributes to the significance of the VNHR District under Criteria a, b, and d of the NRHP; and the HBC Pond contributes to the significance of the VNHR District under Criterion d of the NRHP. A thorough discussion of the significance of the observed resources in VNHR Area #4 is presented in Chapter 10.

Shovel probes excavated by Thomas (1993) were successfully relocated. The distribution of HBC artifacts within the Village seen in the Thomas (1993) probes and recently analyzed by Lynch (personal communication, December 2009) was tested within the CRC APE and verified by our field investigations. No other previous archaeological excavations were observed within VNHR Area #4. The Village house on the western edge of the VNHR Area #4 was not observed within NPS property. An asphalt layer related to U.S. Army or railroad activities appears to be present throughout the western 15 m of the project area.

Undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to HBC Village structures, may still exist within VNHR Area #4. Mechanical stripping of surface sediments should be employed throughout the NPS HBC Village area to test for the presence of buried intact sediments, features, shafts, and pits.

NPS archaeological testing in VNHR Area #4 has demonstrated that the CRC project as proposed will have adverse effects on cultural resources that contribute to the significance of the National-Register-listed VNHR District. Unique and irreplaceable resources on the VNHR within the CRC APE will be destroyed. Resources that may survive the direct effects of the project may lose their eligibility for the NRHP through a loss of integrity. An additional adverse effect will occur when resources are transferred out of federal ownership and lose their protection under federal cultural resources protection laws.

Adverse effects to the cultural resources detailed in this report must be resolved under 36 CFR 800.6. Adverse effects to cultural resources within the CRC APE should be avoided, if possible. If adverse effects cannot be avoided, plans to mitigate these effects should be developed through 36 CFR 800.6 or alternative processes. These efforts should be coordinated with those mitigation requirements associated with Section 4(f) of the U.S. DOT Act of 1966.

CHAPTER 9

VNHR AREA #5: OLD APPLE TREE PARK/ SE COLUMBIA WAY

PROJECT AREA

VNHR Area #5 is located 100-200 m north of the north shore of the Columbia River in the SW quarter of the SW quarter of the SE quarter of Sec 27, T2N, R1E, Willamette Meridian. The elevation of this area is approximately 25 feet above mean sea level (NGVD 29).

The CRC APE in VNHR Area #5 was physically divided into two portions (Figure 147). The first portion was a small triangular area in the north corner of Old Apple Tree Park north of the BNSF railroad berm, south of SR 14, and east of northbound Interstate 5; it measured approximately 250 m^2 (2690 $ft.^2$). The second portion was on the north side of SE Columbia Way south of the BNSF Railway and east of northbound Interstate 5; it measured approximately 155 m (509 ft.) long by 13 m (43 ft.) wide, encompassing an area of approximately 0.19 ha (0.47 ac.). The natural setting consisted of flat fields with mowed grasses and weeds on the Columbia River floodplain.

PROJECT GOALS

Four goals that were addressed through archaeological testing in VNHR Area #5 within the CRC APE mainly concerned the Hudson's Bay Company (1829-1860) and Early U.S. Army (1849-1900) periods:

1. To test for archaeological evidence of HBC and Early U.S. Army-era houses or other structures located in this portion of the Fort Vancouver Village.
2. To test for traces of the roads and utilities shown on historical maps from the mid-to-late 1800s.
3. To record historical archaeological resources greater than 50 years old.
4. To achieve a better understanding of the archaeological resources in this portion of the Fort Vancouver Village and the VNHR to guide further investigations and to better educate the public on the significance and history of the area.

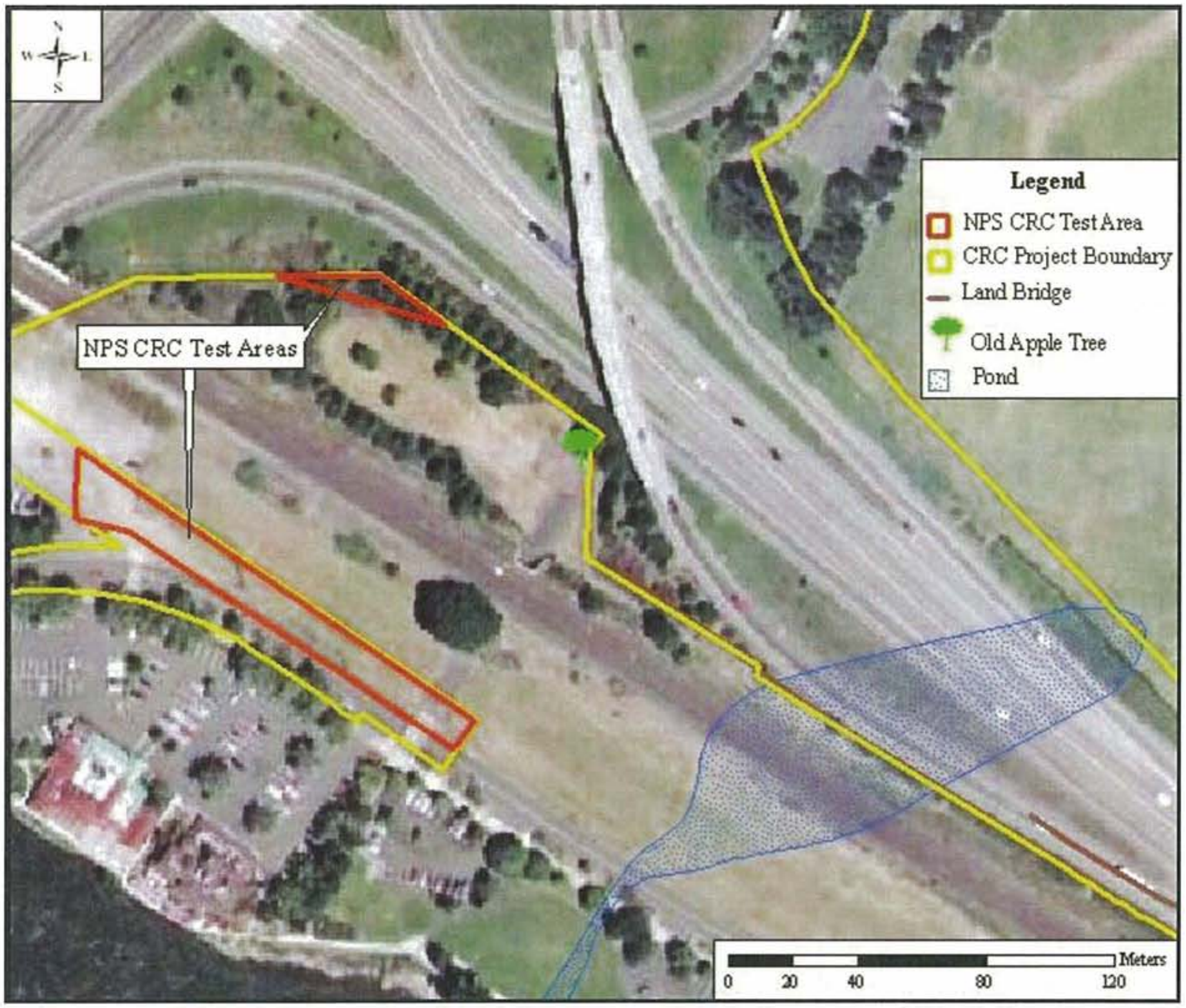

FIGURE 147. The area of NPS archaeological testing in VNHR Area #5 on NPS and City of Vancouver property for the CRC project. Image from Google Earth. (NPS 2010)

HISTORICAL CONTEXT

Historical records and maps were consulted to help determine the cultural resources that were present in VNHR Area #5, where they were located, and if they were likely to be affected by construction during the CRC project. GIS layers digitized from historic maps in the Fort Vancouver archives were georeferenced to modern satellite images (Figure 148).The location of buildings and features helped guide the placement of archaeological test units.

Hudson's Bay Company, 1824-1860

Historical maps show that VNHR Area #5 between SR 14 on the north and SE Columbia Way on the south, was part of the HBC Village, a multicultural settlement where the engagés and employees of the Company – servants, tradesmen, laborers, trappers, and voyageurs – lived in small houses with their families. A salmon store, hospital, workshops, storehouses, sheds, and stables were located in the area of the HBC wharf on the Columbia River. Hussey (1957:218) states that by the late 1840s, as many as 75 structures may have been present within the Village. The number and location of Village structures changed throughout the period of occupation of the HBC as well as seasonally (Figure 3). Although no Village structures are recorded within the VNHR Area #5 project areas, it is possible that the remains of unknown structures are present and may be adversely affected by the CRC project.

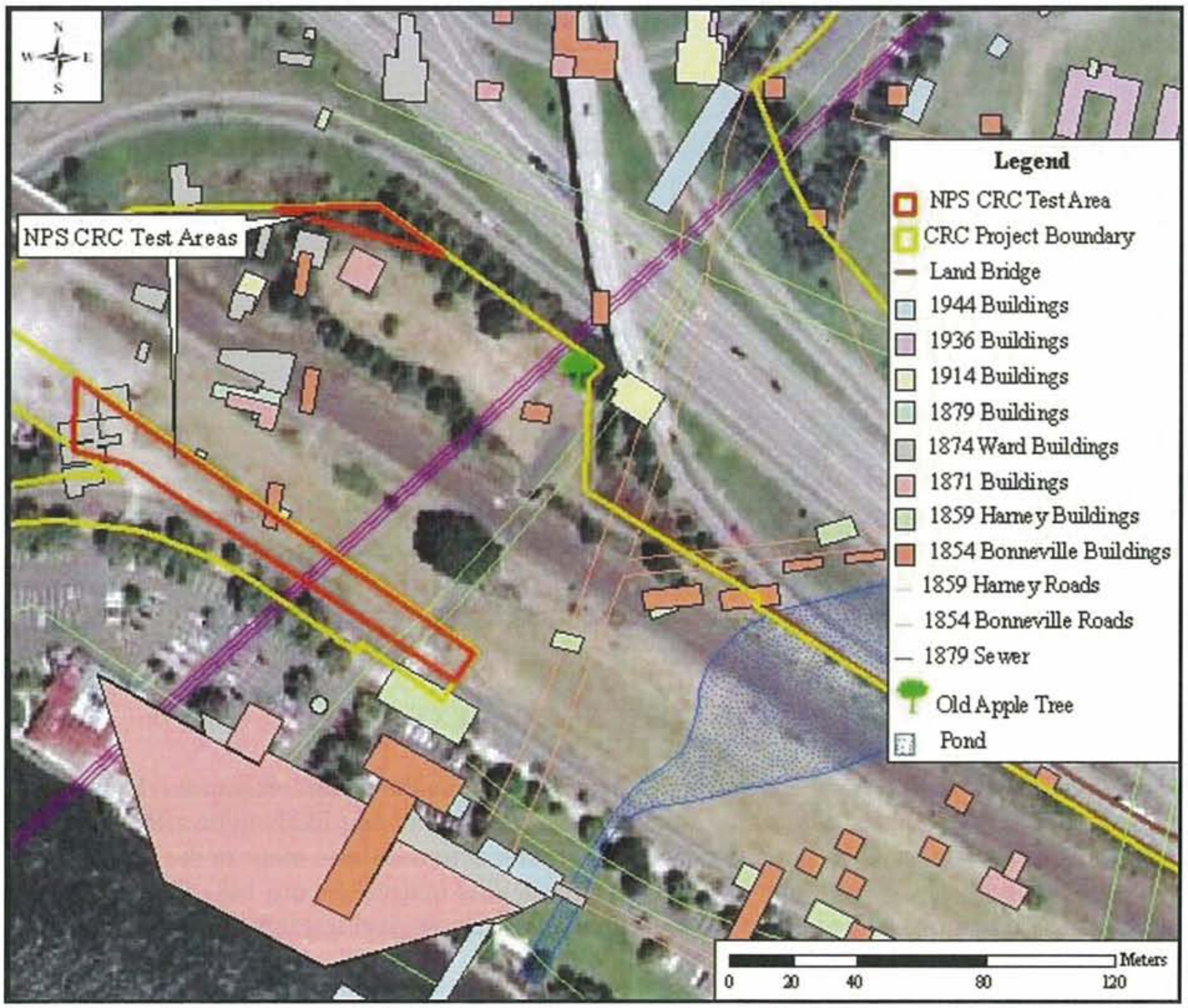

FIGURE 148. VNHR Area #5 in Old Apple Tree Park and SE Columbia Way overlain with historical buildings and features. Image from Google Earth. (NPS 2010)

The apple tree in Old Apple Tree Park is reported to have been planted in 1826. There are several stories about the origin of the tree. In one version, six apple seeds were sent to Mr. R.C. Pambrun and were planted by him. In another version, Lieutenant A. Emilius Simpson brought seeds from England and was responsible for their planting on November 2, 1826. In a third version, a gentleman put the seeds in his pocket at a London party, and planted them at Fort Vancouver in 1826 or 1827 (Thomas and Hibbs 1984:287-288).

The Old Apple Tree is located between the HBC-era James Johnson and John Johnson houses along the main road that ran from St. James Mission through the Village to the Columbia River (later called McLoughlin Road), as seen in the 1846 Covington map (Figure 53). Thomas and Hibbs (1984:112) reported that Assistant Quartermaster Rufus Ingalls lived in the James Johnson house, rented from the HBC, when he first arrived at Camp Vancouver until 1850 when his new house was finished. Ingalls had the James Johnson house moved to the west edge of the military reservation ca. 1859. The John Johnson house was pulled down in 1857 (Thomas and Hibbs 1984:292-293, 297-299).

U.S. Army, 1849-1947

Historical maps show that the area of Old Apple Tree Park has been the location of many episodes of building, road, and railroad construction, renovation, and demolition. The western part of Old Apple Tree Park was the location of several early U.S. Army Quartermaster's and Commissary Depot buildings, many of which bordered West Reserve Street. These structures can be seen in the GIS projections of the 1854 Bonneville, 1859 Harney, 1871 Winman, and 1874 Ward maps (Figure 148).

No mention was made of the function of these buildings until the 1871 Winman map (Figure 149). Two structures south of the 1850 Quartermaster's house ("Officers Quarters") were described as the Quartermaster's Office and the Commissary Office. One of these buildings (or the small structure directly west of the Quartermaster's house?) may be the former James Johnson house. Other structures on the western edge of the Barracks are labeled "Citizen" and "Clerks" on the 1874 Ward map (Figure 5).

A large building on the west side of West Reserve Street can be seen on the 1874 Ward map. This structure was the Vancouver House Hotel within the City of Vancouver, and is within the CRC SE Columbia Way project area.

The CRC project area on the north side of SE Columbia Way was the location of a trestle and berm built in the early 1900s for elevated railroad tracks for the Spokane, Portland and Seattle Railway line. The railroad has been realigned through this area at least twice. Most recently, during a highway improvement project in 1984, the berm was moved 30-40 m (98-131 ft.) north and underpasses were relocated. A coal storage pad, located off a spur line to supply Vancouver Barracks, was initially constructed just north of the railroad line and then moved north and expanded when SR 14 was built in the early 1940s.

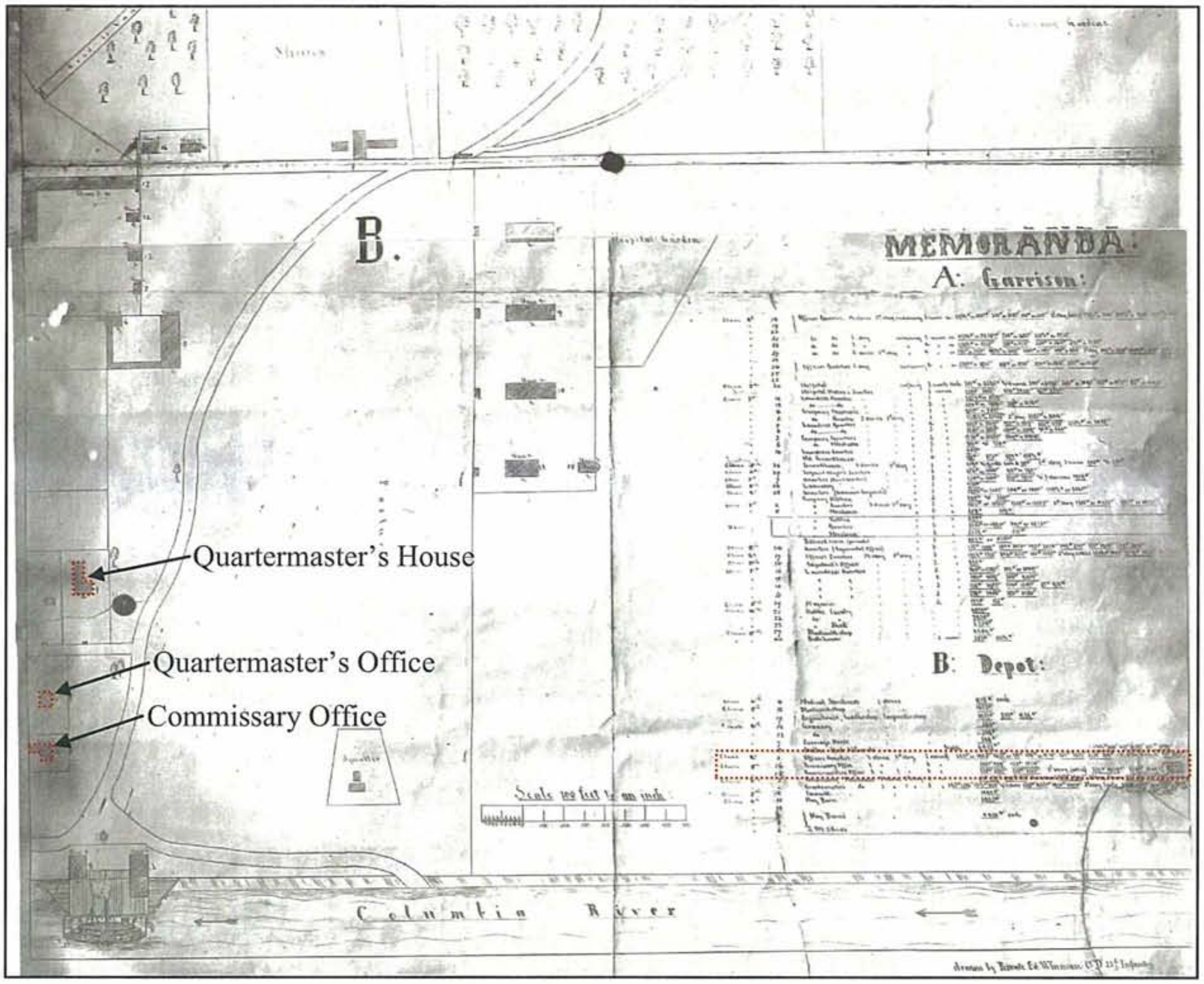

FIGURE 149. Detail of the March 1871 Winman map of Fort Vancouver W.T. with building descriptions.

ARCHAEOLOGICAL CONTEXT

A few archaeological studies have previously been conducted within and near the CRC APE in VNHR Area #5. The following projects are most relevant to the archaeological context of the Old Apple Tree Park and SE Columbia Way portions of the CRC APE (Figure 150).

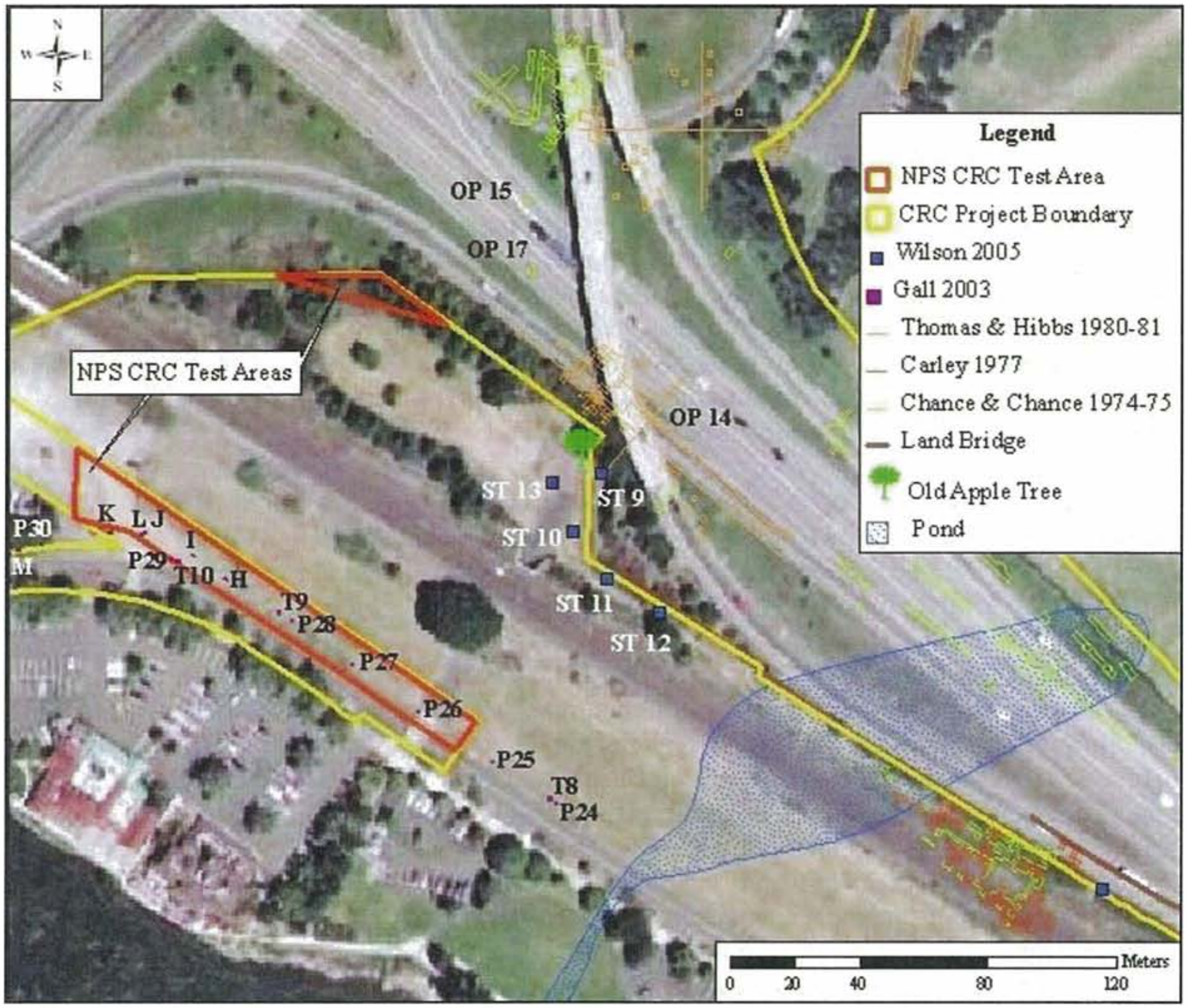

FIGURE 150. VNHR Area #5 in Old Apple Tree Park and SE Columbia Way overlain with previous archaeological investigations. Image from Google Earth. (NPS 2010)

Chance and Chance 1976 and 1982, Carley 1977

In the 1970s, a series of archaeological investigations was conducted in conjunction with improvements to the SR 14/Interstate 5 interchange. In 1974, Chance and Chance (1976) conducted salvage excavations along SR 14 north of VNHR Area #5. Excavation areas were divided into "operations". Operations 14, 15, and 17 were located just north of Old Apple Tree Park.

Operation 14, consisting of a single 5 x 5 ft. TU and a 2.5 ft. wide, 30 ft. long exploratory trench, yielded evidence of both a U.S. Army structure and an earlier HBC structure (Chance and Chance 1976:29). The 1846 Covington (Figure 53) and 1854 Bonneville maps (Figure 12) suggest that this was the location of a Village residence. The 1914 Homan map (Figure 28) shows Building "P" in this location. Chance and Chance (1976:29-30) infer that Building "P" was originally constructed as an ordnance warehouse in about 1883, later converted to a

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residence, and eventually moved to its 1914 site. A comparison of the 1906 Hubbard and 1914 Homan maps (Figures 27-28) and other maps of the time suggests that Building "P" was then moved north in 1906 to clear the right-of-way for railroad construction. It later became the office of the Commissary Chief (Chance and Chance 1976:290). An area of 95 $ft.^2$ was excavated with five features recorded (Chance and Chance 1976:23).

Operation 15 consisted of various types of fill containing mixed 19th- and 20th-century artifacts to a depth of 1.7 ft. Below these deposits was a "thick, foul-smelling silty stratum" (Chance and Chance 1976:30) containing brick, mortar, large wood chips, and a few items of post-1850 cultural material. This debris was hypothesized to have been associated with the Quartermaster's House, located approximately 40 ft. to the north. Sediments in Operation 17 appear to have been disturbed, possibly during the construction of the concrete U.S. Army coal pad, and contained mixed 19th- and 20th-century artifacts (Chance and Chance 1976:30).

In 1977, operations were expanded east of the pond and VNHR Area #5 in the Riverside Complex area of the Village (Carley 1977). This area is located between the Interstate 5 southbound to SR 14 eastbound ramp and the BNSF railroad berm and is not expected to be affected by the CRC project.

Thomas and Hibbs 1984
In 1980-1981, archaeological investigations continued ahead of highway improvements to the SR 14/Interstate 5 interchange and the realignment of the BNSF railroad berm. Thomas and Hibbs (1984) conducted extensive work at Chance and Chance's (1976) Operation 14 north of the Old Apple Tree. The Village house at this location was excavated in its entirety (Thomas and Hibbs 1984:111-299). A total of 109, 5 x 5 ft. excavation units and a 210 ft. long backhoe trench were excavated. Hundreds of features and over 40,000 artifacts were recorded. The John Johnson house site represents the most intensively excavated HBC Village house site to date. Remnants of McLoughlin Road were found to the east of the house and the Old Apple Tree. The backhoe trench and 10, 5 x 5 ft. units to the east of the John Johnson house identified only disturbed deposits associated with Building "P".

Operation 51 consisted of 32, 18 in. mechanical auger tests excavated in Old Apple Tree Park at the location of a proposed pedestrian underpass under the realigned BNSF Railway (Thomas and Hibbs 1984:403). The auger holes were dug by WSDOT and monitored by a NPS archaeologist. Remains of McLoughlin Road were found, but artifacts were sparse. Significant deposits were not identified.

Gall 2003
In 2002-2003, Gall conducted archaeological testing for Northwest Natural Gas within the right-of-way of a proposed gas pipeline on the north side of SE Columbia Way. The western portion of the test area is within the current CRC APE. Small, mechanically excavated test probes (TP) were systematically excavated at 300 ft. (91.4 m) intervals throughout the project area, followed by 50 x 50 cm TUs in areas where cultural deposits were observed. Data recovery with 50 x 100 cm excavation units (EU) was then conducted at the location of potentially significant cultural deposits seen in the first two phases of testing.

TP24 through TP31, and TU8 through TU10, are within the CRC APE. No cultural material was observed at TP24, TP25, TP27, TP28, or TP31. TP26 showed signs of an old roadbed but no other cultural material. TU8 was excavated near TP24, with a feature consisting of a basin-shaped charcoal stain, and a few mixed 19th- and early 20th-century artifacts collected. TU9 was excavated 3 m west of TP28, with a small quantity of mixed late 19th- and 20th-century artifacts recovered. A concentration of historical artifacts was observed in TP29 at a depth of 115 cm. TU10, excavated 2 m east and 2.5 m north of TP29, encountered a possible intact deposit of 19th-century artifacts at a depth of 120-150 cm. TP30 contained a few mixed late 19th- and 20th-century artifacts.

Data recovery units EU H through EU N were excavated to further explore the western portion of the project area. Sediments in EU H, EU I, EU M, and EU N were disturbed and mixed. EU J, EU K, and EU L were located in the area of a building seen on the 1874 Ward map of Vancouver Barracks. Gall assumed that this was a U.S. Army building, but after consulting the Vancouver Sanborn fire insurance maps, this researcher discovered that the structure was the Vancouver House Hotel. Gall found a significant deposit of late 19th-century domestic artifacts associated with the hotel in these three EUs beginning at a depth of 150 cm. Feature 1, a brick wall or foundation, was observed beginning at 90 cm in EU J and EU L. Cultural material from these three EUs appeared somewhat disturbed or mixed, however. Gall concluded that the western portions of the project area tested for the proposed gas pipeline had been extensively affected by ground-disturbing activities. Because sediments were observed to change drastically within a meter or two, though, intact archaeological deposits could still be present within the project area. A 1939 aerial photograph (Gall 2003:C-2) shows what appears to be the deposition of dredge spoils in the area in the late 1930s. Gall also mentions that the area was leveled in a massive deposition of dredge spoils again in the 1960s (Gall 2003:97).

Land Bridge 2005-2007

Wilson (2005) conducted archaeological testing for the proposed Confluence Project Land Bridge in 2004. Five shovel tests (ST09 through ST13) and three backhoe pits (Pit 3 through Pit 5) were excavated in Old Apple Tree Park between SR 14 and the BNSF railroad berm to determine if any intact archaeological deposits in this area would be affected.

Shovel tests ST09 through ST13 contained largely disturbed deposits. Fill was present to a depth of 40-45 cm in ST09 and ST10. A buried A horizon was observed in ST10 at a depth of 70-77 cm. Both ST09 and ST10 contained a mix of modern and historical artifacts within the fill, with very few artifacts found in the intact sediments below. The buried deposit in ST10 contained only coal. Historical artifacts were of mixed 19th- and 20th-century origin with no significant intact deposits observed. ST11 and ST12 consisted of fill associated with the original alignment of SR 14 to a depth of 70 cm. In ST12, intact but sterile deposits were observed at 1.5 m in Pit 5 (below) excavated later at this location. ST13 consisted of disturbed deposits to a depth of 60 cm, with a mix of modern and historical artifacts to the base of the excavation (Wilson 2005:25-26).

The depth of fill over intact sediments ranged between 3.4 m in Pit 3 and 1.5 m in Pit 5. In Pit 3, excavations stopped before encountering undisturbed (probably pond) sediments. Pit 4 and Pit 5 did not contain cultural deposits below the fill; they were likely destroyed in one of the SR 14 construction phases. Only 20th-century artifacts were observed (Wilson 2005:24-25).

The results of test excavations located south of SR 14 further east of VNHR Area #5 (ST14 and ST15, Pit 6 and Pit 7) showed significant intact pond deposits at a depth of at least 3.8 m, and intact HBC Village/Riverside Complex deposits at 1.2 to 1.5 m overlying a late prehistoric/protohistoric component (Wilson 2005:31-32). Although no potential impacts from the CRC project are anticipated here, the proposed CRC APE must be strictly adhered to in this area, and any disturbance below the fill deposits should be treated through data recovery excavations.

METHODS

The National Park Service conducted archival research, remote sensing surveys, and archaeological test excavations within the CRC APE in VNHR Area #5 in Old Apple Tree Park and on the north side of SE Columbia Way to identify archaeological resources that may be adversely affected by the CRC project.

Geophysical Surveys

Remote-sensing surveys were conducted within VNHR Area #5 in two survey grids within Old Apple Tree Park, and two survey grids on the north side of SE Columbia Way. The magnetometer survey was conducted on January 29, 2009 by Kendal McDonald of Z-Too Archaeogeophysical Prospection. The ground penetrating radar survey was conducted on February 19-20, 2009 by Steve De Vore of the NPS Midwest Archaeological Center.

Archaeological Test Excavations

The NPS conducted subsurface testing within VNHR Area #5 to target anomalies seen in the geophysical surveys, in areas of possible historical buildings and features seen on historical maps and documents, to answer the questions outlined in the Project Goals section, and at regular intervals throughout the project area. Anticipated findings in this area consisted primarily of archaeological deposits associated with HBC Village, early U.S. Army, and early Vancouver structures and roads. Because the quantity and location of Village structures changed during the period of HBC occupation, as well as seasonally (Figure 3), all areas of the Village have the potential to contain intact archaeological deposits associated with these buildings.

Thick layers of fill covered the ground surface throughout VNHR Area #5 within the CRC APE. Units were excavated by hand within Old Apple Tree Park. A backhoe was utilized on the north side of SE Columbia Way (Figure 151) to excavate exploratory trenches to sample sediments and to remove fill layers to access buried archaeological deposits and features.

FIGURE 151. Dave DeLyria excavating exploratory backhoe Trench 5-02 with monitors Leslie O'Rourke and Rachel Stokeld on the north side of SE Columbia Way, facing west. (NPS 09-09:14, 4/14/09)

EXCAVATION RESULTS

From March 30 to April 6, 2009, and April 16 to May 8, 2009, the NPS conducted archaeological testing within VNHR Area #5 on City of Vancouver property in Old Apple Tree Park, and on NPS property on the north side of SE Columbia Way (Figure 152). The project area within Old Apple Tree Park was located within a small triangle in the northwest corner of the park. The project area on the north side of SE Columbia Way extended from just east of the pedestrian walkway into Old Apple Tree Park, east to a gravel parking lot northeast of the Clark PUD building.

Twenty-one exploratory backhoe trenches (Trench 5-01 through Trench 5-21) totaling 58.4 m in length (54.6 m^2) were excavated on the north side of SE Columbia Way (Table 29). A 36 in. (91 cm) smooth bucket was used in the eastern portion of the SE Columbia Way project area to sample sediments and to remove deep sandy fill layers to access buried archaeological deposits and features. An 18 in. (46 cm) toothed bucket was used in the far western portion of the SE Columbia Way project area to sample cultural strata below deep deposits of construction debris and fill. Four STs (ST5-01 through ST5-04) totaling 1.0 m^2, and two TUs (TU5-01 and TU5-02) totaling 2.0 m^2 were excavated in the northwest corner of Old Apple Tree Park (Table 30). Eleven TUs (TU5-03 through TU5-13) totaling 10.3 m^2 were excavated on the north side of SE Columbia Way (Table 30), with nine features (Features 5-15) recorded in TU5-09 through TU5-13 at the western end of the project area (Table 31).

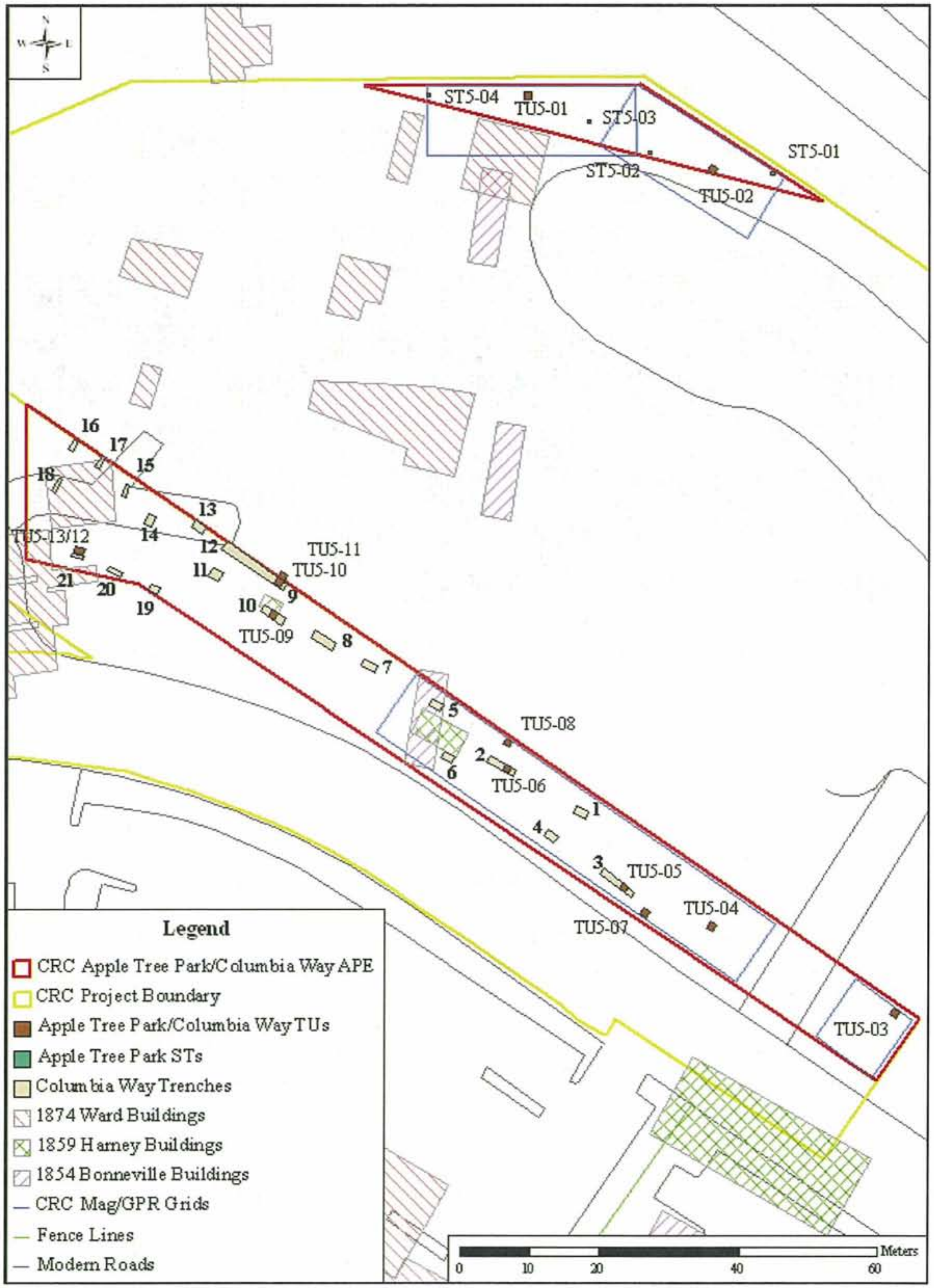

FIGURE 152. Backhoe trenches (numbered 1-21), TUs (TU5-01 through TU5-13), and STs (ST5-01 through ST5-04) in VNHR Area #5. (NPS 2010)

TABLE 29
EXPLORATORY BACKHOE TRENCHES WITHIN VNHR AREA #5.

Trench	Dimensions (cm)				Associated Test Units	
	Width	Length	Depth of Fill	Maximum Depth	Unit(s)	Findings*
5-01	105	190	>185	185	-	-
5-02	105	480	46-60	170	5-06	-
5-03	100	540	75-80	140	5-05	-
5-04	115	190	>200	200	-	-
5-05	105	200	3	90	-	-
5-06	105	170	20-30	110	-	-
5-07	105	220	35-40	80	-	-
5-08	105	390	85	85	-	-
5-09	105	900	65	110	5-10, 5-11	+
5-10	105	380	75	75	5-09	+
5-11	105	180	>52	52	-	-
5-12	105	250	75	115	-	-
5-13	105	210	>82	82	-	-
5-14	105	190	>84	84	-	-
5-15	45	190	>110	110	-	-
5-16	50	190	52	110	-	-
5-17	45	200	>100	100	-	-
5-18	100	200	130	184	-	-
5-19	100	150	70	110	-	-
5-20	50	230	82	108	-	-
5-21	50	190	110	125	5-12, 5-13	+

*significant archaeological deposits in intact strata (+ or -)

TABLE 30.
ARCHAEOLOGICAL TEST UNITS AND SHOVEL TESTS WITHIN VNHR AREA #5.

Unit	Backhoe Trench	Maximum Depth (cm)	Findings
Old Apple Tree Park			
ST5-01	-	60	disturbed
ST5-02	-	50	disturbed
ST5-03	-	50	disturbed
ST5-04	-	80	disturbed
TU5-01	-	130	disturbed
TU5-02	-	72	disturbed
SE Columbia Way			
TU5-03	-	61	disturbed
TU5-04	-	75	disturbed
TU5-05	5-03	102	disturbed
TU5-06	5-02	84	disturbed
TU5-07	-	60	disturbed
TU5-08	-	54	disturbed
TU5-09	5-10	230	U.S. Army building, 1859 Harney map
TU5-10	5-09	90	U.S. Army building, 1859 Harney map
TU5-11	5-09	89	U.S. Army building, 1859 Harney map
TU5-12	5-21	185	Vancouver House Hotel
TU5-13	5-21	185	Vancouver House Hotel

TABLE 31.
ARCHAEOLOGICAL FEATURES RECORDED WITHIN VNHR AREA #5.

Feature	Test Unit	Trench	Description
5	5-10, 5-11	5-09	midden, U.S. Army building, 1859 Harney map
6	5-10, 5-11	5-09	midden wood, U.S. Army building, 1859 Harney map
7	5-09	5-10	midden, U.S. Army building, 1859 Harney map
8	5-12	5-21	midden, Vancouver House Hotel
9	5-10	5-09	modern posthole (railroad?)
10	5-11	5-09	modern posthole (railroad?)
11	5-12, 5-13	5-21	modern utility trench, post remnant (railroad?)
14	5-09	5-10	midden wood, U.S. Army building, 1859 Harney map
15	5-09	5-10	lower midden, U.S. Army building, 1859 Harney map

note: Features 12 and 13 were not assigned.

Old Apple Tree Park

The project area in Old Apple Tree Park portion of VNHR Area #5 was located in the northwest corner of the park along a 70 m (230 ft.) section of the SR 14 highway chain link fence, within 10 m (33 ft.) of the fence (Figure 153). The area was within a border planting of shrubs and small trees in barkdust adjacent to the park lawn area. Four STs (ST5-01 through ST5-04) and two TUs (TU5-01 and TU5-02) were manually excavated within the park. Units were oriented to true north with the exception of TU5-02, which was oriented to grid north (32° east of true north).

The stratigraphic sequence observed in the northwest corner of Old Apple Tree Park showed considerable ground disturbance from road construction and subsequent landscaping. An example of the stratigraphic sequence for this area is described below for TU5-01 (Figure 154).

FIGURE 153. West and east grid areas in VNHR Area #5 within Old Apple Tree Park, showing the overlapping survey grids, facing west. (NPS 09-02:297, 1/29/09)

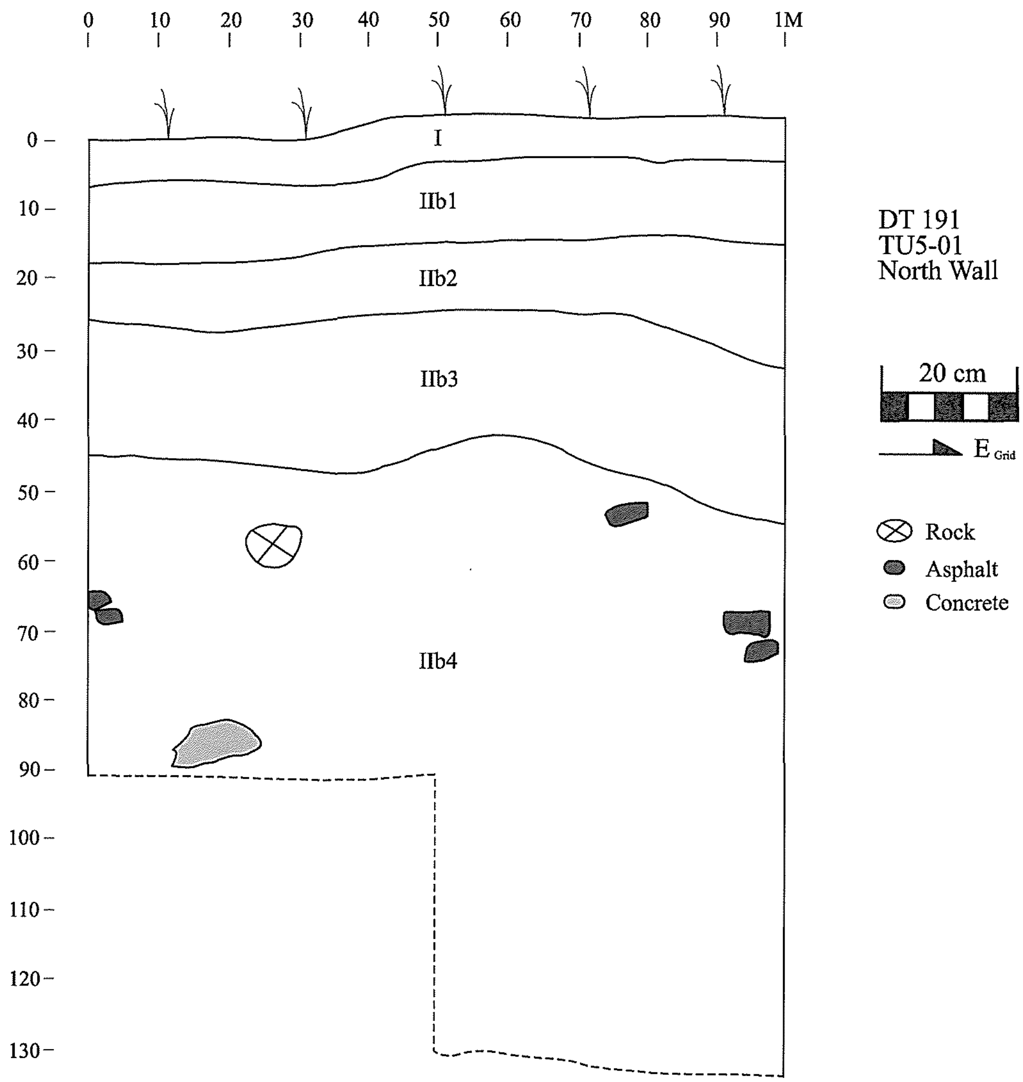

FIGURE 154. North wall profile of TU5-01 in the Old Apple Tree Park portion of VNHR Area #5. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR2/1 black silt loam with 10% gravels, bark dust mulch, duff, roots, modern debris.
Stratum IIb1:	10YR2/2 dark brown silt loam, 20-30% gravels, few 20th-century artifacts.
Stratum IIb2:	Very compact 10YR3/3 dark brown sandy silt loam, 40-60% gravels, concrete and asphalt rubble construction debris and a mix of 19th- and 20th-century artifacts.
Stratum IIb3:	Very compact 10YR3/4 dark yellowish brown silt loam, 40-60% gravels, concrete and asphalt rubble construction debris and a mix of 19th- and 20th-century artifacts.
Stratum IIb4:	Loose and unconsolidated, 10YR4/1dark gray gravelly sand, 60-70% gravels, concrete and asphalt rubble construction debris and a few mixed 19th- and 20th-century artifacts.

Old Apple Tree Park Test Units

Data on the volume of sediments excavated and the number of artifacts recovered from the TUs in VNHR Area #5 are presented in Table 32.

TU5-01

TU5-01 was located in the west grid within Old Apple Tree Park at the location of a magnetic anomaly. Sediments consisted of a gravelly dark gray/brown silt loam fill below 20 cm. Cultural material recovered from the first 60 cm consisted mostly of modern trash mixed with a few historical artifacts, dominated by brick and coal. Sediments in this unit appeared to consist mainly of fill from an old roadbed. Concrete and asphalt chunks extended to at least 130 cm: the entire unit was excavated to 90 cm, and then the northwest quadrant was excavated to 130 cm. B-horizon deposits were not reached in the northwest quadrant. No buried cultural layer was observed. It was concluded that the magnetic anomaly may have been caused by roadbed material.

TU5-02

TU5-02 was located in the east grid within Old Apple Tree Park at the location of a large rectangular GPR anomaly. Sediments consisted of a gravelly dark brown silt loam fill to a depth of 30 cm. A moderate number of mixed 19th- and 20th-century artifacts were observed within 40 cm of the surface. Sterile B-horizon sediments were encountered at 35 cm; C-horizon sediments were reached at 50 cm. The abrupt boundary between the fill and B horizon suggests that any buried cultural layer may have been scraped off when the area was leveled. The source of the GPR anomaly was not discovered. It was concluded that the anomaly might have been caused by trees or their roots: two trees closely define the area seen as an anomaly in GPR.

Old Apple Tree Park Shovel Tests

Data on the volume of sediments excavated and the number of artifacts recovered from the STs in VNHR Area #5 are presented in Table 32.

ST5-01

ST5-01 was located in the northeast corner of the east grid. A small number of mixed modern and historical artifacts were found in gray brown silt loam fill to a depth of 30 cm over intact sterile B-horizon deposits. A plastic irrigation pipe and intrusive fill were observed in the north portion of the unit from 25-35 cm above the B-horizon sediments.

ST5-02

ST5-02 was located within the east grid at the location of a magnetic anomaly. A small number of mixed modern and historical artifacts were found in dark gray silt loam fill to a depth of 35 cm over intact sterile B-horizon deposits. The stratification was similar to TU5-02. The magnetic anomaly was not located.

ST5-03

ST5-03 was located on the east side of the west grid. A few mixed modern and historical artifacts were found in dark gray silt loam fill to a depth of 20 cm over leveled, but intact sterile B-horizon sediments.

TABLE 32
EXCAVATION RESULTS FOR OLD APPLE TREE PARK IN VNHR AREA #5

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU5-01									
1	0-11	0.1075	91	847	-	-	2	-	-
2	11-21	0.0950	97	1021	-	5	17	1	-
3	21-32	0.1050	43	410	4	5	21	4	-
4	32-42	0.1000	49	490	3	-	17	-	-
5	42-54	0.1200	3	25	-	-	2	-	-
6	54-62	0.0800	2	25	-	-	1	-	-
7	62-74	0.1150	1	9	-	-	-	-	-
8	74-85	0.1100	-	-	-	-	-	-	-
9	85-93	0.0750	-	-	-	-	-	-	-
10	93-133	0.1000	-	-	-	-	-	-	-
Total		1.0075	286	284	7	10	60	5	-
TU5-02									
1	0-9	0.0875	226	2583	1	-	9	-	-
2	9-19	0.1000	131	1310	5	10	27	2	1
3	19-29	0.1000	86	860	3	2	20	5	4
4	29-40	0.1050	19	181	1	-	2	-	-
5	40-51	0.1050	-	-	-	-	-	-	-
6	51-69	0.1750	-	-	-	-	-	-	-
Total		0.6725	462	687	10	12	58	7	5
ST5-01									
1	0-10	0.025	3	120	-	-	3	-	-
2	10-20	0.025	27	1080	2	-	21	1	-
3	20-30	0.025	2	80	-	-	-	-	-
4	30-40	0.025	2	80	-	-	-	-	-
5	40-50	0.025	-	-	-	-	-	-	-
6	50-60	0.025	-	-	-	-	-	-	-
Total		0.150	34	272	2	-	24	1	-
ST5-02									
1	0-10	0.025	1	40	-	-	-	-	-
2	10-20	0.025	13	520	6	2	2	-	-
3	20-30	0.025	16	640	3	1	7	1	-
4	30-40	0.025	4	160	-	-	-	-	-
5	40-50	0.025	-	-	-	-	-	-	-
Total		0.125	34	272	9	3	9	1	-

Continued on next page

TABLE 32
EXCAVATION RESULTS FOR OLD APPLE TREE PARK IN VNHR AREA #5 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
ST5-03									
1	0-10	0.025	-	-	-	-	-	-	-
2	10-20	0.025	14	560	7	-	4	-	-
3	20-30	0.025	-	-	-	-	-	-	-
4	30-40	0.025	-	-	-	-	-	-	-
5	40-50	0.025	-	-	-	-	-	-	-
Total		0.125	14	112	7	-	4	-	-
ST5-04									
1	0-10	0.025	-	-	-	-	-	-	-
2	10-20	0.025	1	40	-	-	-	-	-
3	20-30	0.025	4	160	-	-	-	-	-
4	30-40	0.025	2	80	-	-	2	-	-
5	40-50	0.025	3	120	-	-	-	2	-
6	50-60	0.025	8	320	-	-	3	2	-
7	60-70	0.025	6	240	1	-	-	-	-
8	70-80	0.025	6	240	-	1	1	-	-
Total		0.200	30	150	1	1	6	4	-
GRAND TOTAL		**2.28**	**860**	**377**	**36**	**26**	**161**	**18**	**5**

*Personal and domestic items

ST5-04

ST5-04 was located in the northwest corner of the west grid. A small number of mixed modern and historical artifacts were found in brown silt loam fill, consisting of at least three separate fill deposits, to a depth of 80 cm. B-horizon sediments were not reached.

SE Columbia Way

The SE Columbia Way portion of VNHR Area #5 was located on NPS property in an area of grass and weeds, beginning just east of the underpass into Old Apple Tree Park, and extending approximately 155 m (510 ft.) west into a gravel parking lot (Figures 155-157). The project area was within 15 m (50 ft.) of the north side of SE Columbia Way.

Twenty-one exploratory backhoe trenches (Trench 5-01 through Trench 5-21) and 11 TUs (TU5-03 through TU5-13) were excavated within the project area on the north side of SE Columbia Way (Figure 152). Backhoe trenches were excavated to the depth of B-horizon sediments or to the maximum reach of the backhoe. Profiles were drawn of a one-meter segment of each unit. Trenches deeper than 120 cm were profiled from the surface and lower stratum depths were approximated.

TUs included seven that were excavated within or adjacent to backhoe trenches and oriented to an axis of their trench. Level 1 of these TUs encompassed the entire extent of the mechanically removed fill. Four isolated TUs (TU5-03, TU5-04, TU5-07, and TU5-08) were oriented to grid north (33° east of true north). Nine features (Features 5-11 and Features 14-15) were recorded in TU5-09 through TU5-13 in the western end of the project area.

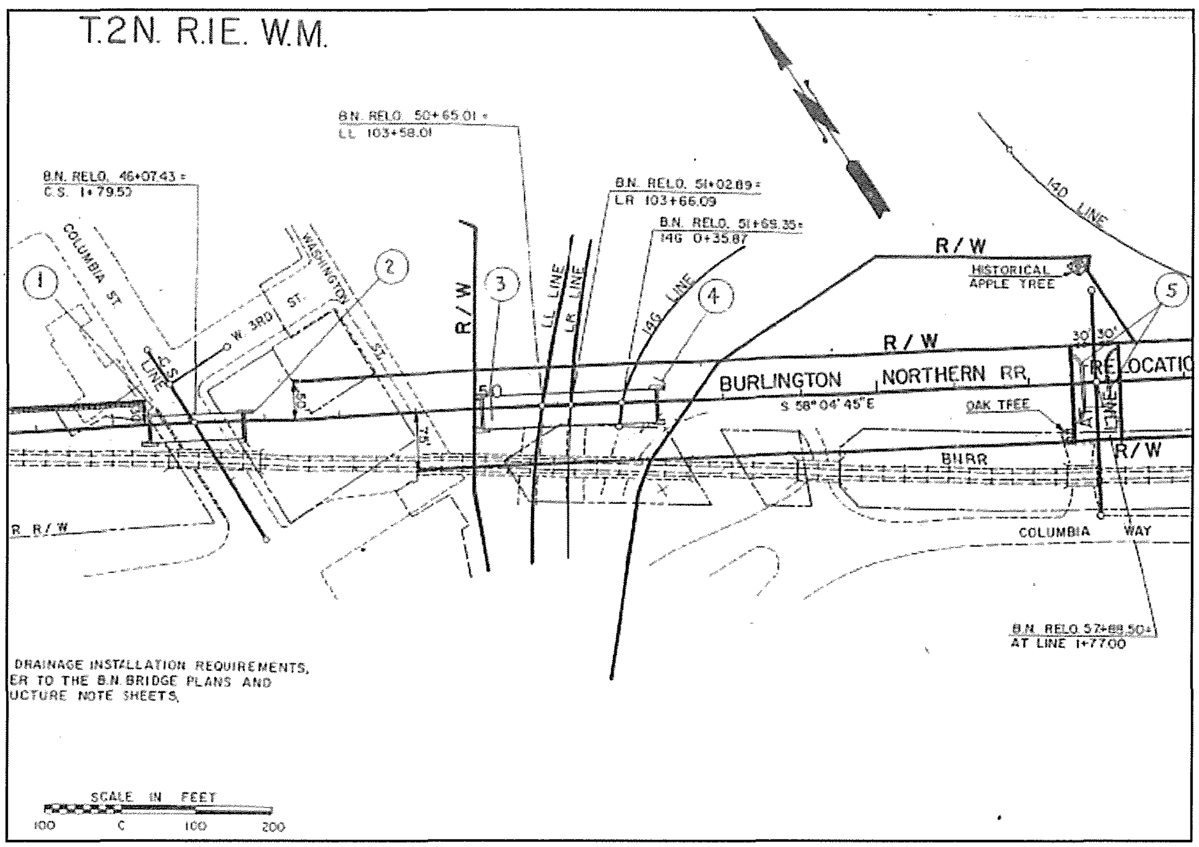

FIGURE 155. BNRR relocation plans from 1981, showing the previous and present locations of the railroad berm and underpasses (Gall 2003:C-6).

FIGURE 156. Steve De Vore conducting the GPR survey in VNHR Area #5 on the north side of SE Columbia Way, facing west. (NPS 09-03:5, 2/20/09)

FIGURE 157. Eric Gleason laying out the remote sensing grid at the west end of VNHR Area #5 on the north side of SE Columbia Way, facing west. (NPS 09-02:319, 1/29/09)

Many episodes of ground disturbance have affected different parts of VNHR Area #5 on the north side of SE Columbia Way. The depth of fill varies significantly throughout this area. A brown silt loam with abundant machine crushed gravels and broken rock is present over most of the project area. This stratum overlies massive silts, assumed to be imported dredge spoils, east of approximately the middle of Trench 5-09. West of approximately the middle of Trench 5-09, the silt is replaced by a very dark brown gravelly silt loam with concrete chunks and other construction debris. Intact A-horizon deposits are largely confined to the western portion of the project area. An example of the stratigraphic sequence for this area is described below for TU5-05 (Figure 158).

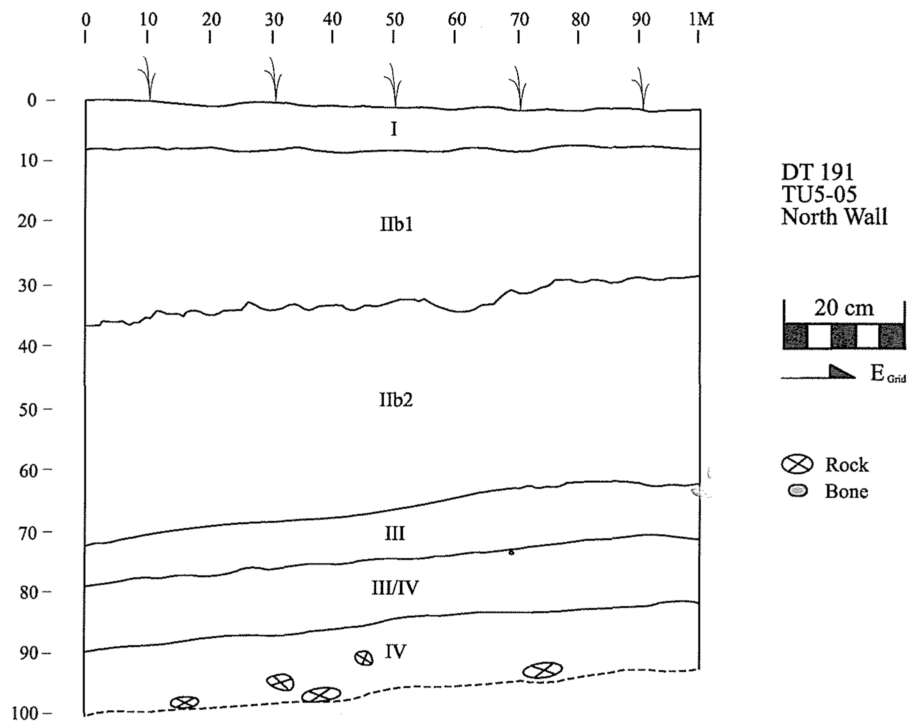

FIGURE 158. North wall profile of TU5-05 in VNHR Area #5 on the north side of SE Columbia Way. (NPS 2010)

Stratum I:	Sod/topsoil, 10YR2/2 very dark brown silt loam, 10% gravels, small roots, modern debris.
Stratum IIb1:	10YR3/2 very dark grayish brown silt loam, 70% angular gravels, no artifacts.
Stratum IIb2:	10YR4/3 brown to 10YR3/4 dark yellowish brown fine sandy silt dredge spoils, no artifacts.
Stratum III:	10YR2/2 very dark brown silt loam, 10% gravels, low density of 19th-century artifacts.
Stratum IV:	B horizon, 10YR3/4 dark yellowish brown gravelly silt loam, culturally sterile.

SE Columbia Way Backhoe Trenches

Trench 5-01

Trench 5-01 was excavated in an area that appeared as a blank rectangle on the GPR map. Sediments consisted of undifferentiated fine silty sand dredge spoil fill to 185 cm. Remnants of a modern post, likely a telephone pole, were seen at 30 cm. No other artifacts or buried cultural layer were observed. The trench was terminated at 185 cm. The GPR feature was assumed to be associated with the massive silt deposit, the bottom of which was not reached.

Trench 5-02

Trench 5-02 was excavated in the area of a magnetic anomaly. A buried cultural layer was observed on the east end of the trench, dipping to the east, beginning at 44-76 cm; no artifacts were observed. TU5-06 (see unit summary below) was excavated 2.3 m from the east end of the trench. Fill sediments on the west side of this trench consisted of 40 cm of sandy silt dredge spoils with few gravels. B-horizon sediments were reached at 56 cm; the trench was terminated at 170 cm.

Trench 5-03

A buried cultural layer was observed in Trench 5-03 from 62-82 cm. A grab sample from the trench consisted of an entire 1946 Coke bottle and the base of a 1947 Pommerelle wine bottle, found with other glass fragments from 20-30 cm on the east side of the south wall of the trench. TU5-05 (see unit summary below) was excavated 2 m from the east end of the trench. Fill sediments on the west side of the trench consisted of 28 cm of cobbly, gravelly silt loam, over 40 cm of sandy dredge spoils. B-horizon sediments began at 95 cm; C-horizon deposits were reached at 130 cm. The trench was terminated at 140 cm.

Trench 5-04

Fill sediments in Trench 5-04 consisted of gravelly and sandy dredge spoils to 50 cm, over a silt loam layer with large gravels and cobbles to 95 cm, over sandy silt dredge spoils to 200 cm. A gley lens with gravel and charcoal was observed from 170-180 cm. B-horizon sediments were not reached. No artifacts or buried cultural layer were observed.

Trench 5-05

Trench 5-05 was excavated in the area of an unidentified structure on the 1854 Bonneville map and the 1859 Harney map (Figure 159). B-horizon sediments were observed just below the sod to a depth of 40 cm. C-horizon deposits extended to 90 cm, where the trench was terminated. No fill strata were present; no artifacts or buried cultural layer were observed.

Trench 5-06

Trench 5-06 was excavated in the area of an unidentified structure on the 1854 Bonneville map and the 1859 Harney map (Figure 159). A fill layer consisting of coarse basalt gravels and cobbles began just below the sod to a depth of 20 cm over B-horizon sediments. Sediments dipped to the east. C-horizon deposits began at 40 cm; the trench was terminated at 110 cm. No artifacts or buried cultural layer were observed.

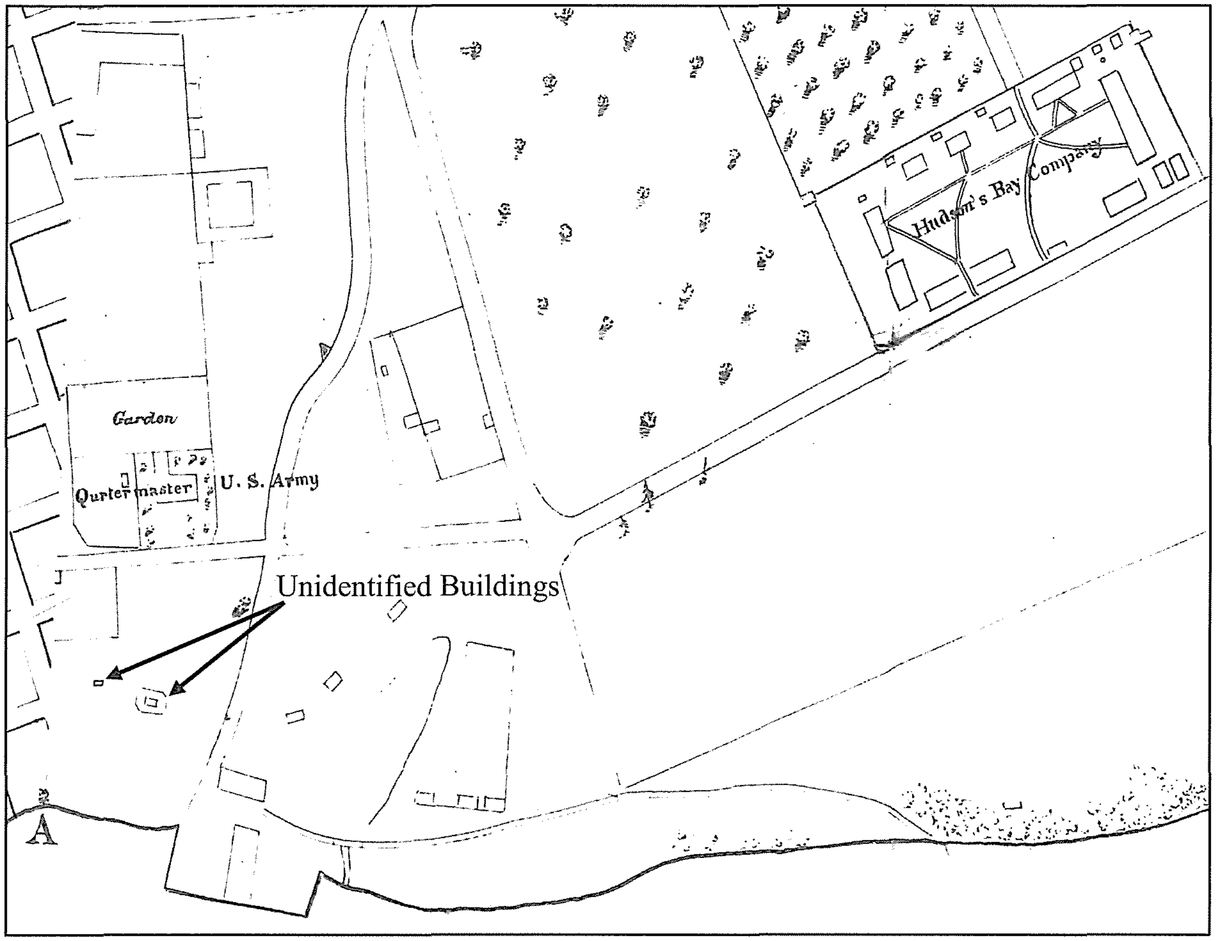

FIGURE 159. Detail of the 1859 Harney map of the military reservation at Fort Vancouver, showing two unidentified buildings between the Quartermaster's house and the river.

Trench 5-07

Sediments in Trench 5-07 consisted of sandy silt fill to a depth of 35-40 cm, dipping to the west. B-horizon sediments were mixed with large gravels and cobbles. C-horizon deposits began at 80 cm, where the trench was terminated. No artifacts or buried cultural layer were observed.

Trench 5-08

Sediments in Trench 5-08 consisted of sandy silt fill to a depth of 85 cm over a buried cultural layer. Few artifacts were present within the cultural layer; none were collected. A metal rod was observed extending from the north wall of the trench at 80 cm. B-horizon sediments were reached at 85 cm, where the trench was terminated.

Trench 5-09

An intact buried cultural layer was observed in Trench 5-09 beginning at 25 cm. TU5-10 was excavated 1.5 m from the east end of Trench 5-09; TU5-11 was located adjoining TU5-10 on the north (see unit summaries below). The grab sample from this trench consisted of a moderate number of 19th-century artifacts. Fill on the west side of Trench 5-09 consisted of 25 cm of gravelly silty sand, over 40 cm of gravelly silt loam mixed with chunks of concrete and other construction debris. Sediments on the west side of the trench dipped to the west and 15% to the south. A terracotta sewer pipe was observed from 60-110 cm, capped by fill deposits. No B-horizon sediments were observed. C-horizon deposits began at 65cm; the trench was terminated at 110 cm. No intact cultural deposits were observed in Trench 5-09 west of TU5-10.

Trench 5-10

Trench 5-10 was excavated in the area of small, unidentified structure on the 1859 Harney map (Figure 159). An intact buried cultural layer was observed under 75 cm of silty sand dredge spoils. TU5-09 (see unit summary below) was excavated in the center of Trench 5-10. No grab sample was collected.

Trench 5-11

Sediments in Trench 5-11 consisted of very rocky, disturbed fill with concrete chunks below 10 cm of sod. An impenetrable concrete layer was reached at 52 cm. No artifacts or buried cultural layer were observed.

Trench 5-12

Trench 5-12 was a western extension of Trench 5-09. Fill sediments were observed to a depth of 75 cm over C-horizon deposits, similar to what was described above for the west side of Trench 5-09. The trench was terminated at 115 cm. Pieces of terracotta sewer tile were seen in this trench as well. No other artifacts or buried cultural layer were observed.

Trench 5-13

Sediments in Trench 5-13 consisted of gravelly silt fill below 6 cm of sod. Concrete was encountered at 74 cm and became impenetrable by 82 cm. No artifacts or buried cultural layer were observed.

Trench 5-14

Sediments in Trench 5-14 are similar to Trench 5-13. Concrete was encountered at 52 cm and became impenetrable by 84 cm. No artifacts or buried cultural layer were observed.

Trench 5-15

Fill sediments in Trench 5-15 consisted of gravelly silt to 40 cm, over 30 cm of silty sand dredge spoils, above 40 cm of concrete rubble. B-horizon deposits were not reached before the concrete rubble became impenetrable at 110 cm. No artifacts or buried cultural layer were observed.

Trench 5-16

Fill sediments in Trench 5-16 consisted of 10 cm of parking lot gravel, over 26 cm of gravelly silt, over 16 cm of silty sand dredge spoils. A buried cultural layer was located from 52-84 cm, although this layer did not appear to be intact. The deposit appeared to be mixed, possibly a redeposited late 19th-century cultural layer most likely from the Vancouver House Hotel (see TU5-12 and TU5-13 below). This lens ended abruptly. B-horizon sediments were missing; C-horizon deposits were observed from 84-110 cm. A grab sample of several 19th-century artifacts was collected.

Trench 5-17

Fill sediments in Trench 5-17 were similar to Trench 5-15, and consisted of 7 cm of parking lot gravel, over 30 cm of gravelly silt, over 38 cm of silty sand dredge spoils, over 25 cm of concrete rubble. A very thin buried cultural layer was observed just above the concrete rubble. B-horizon sediments were not reached before the concrete rubble became impenetrable at 100 cm. No artifacts were observed.

Trench 5-18

Sediments in Trench 5-18 consisted of 10 cm of parking lot gravel over 120 cm of concrete rubble fill. A buried cultural layer dipping to the south and containing 19th-century artifacts was located below the fill from 130-160 cm. This material was likely from the Vancouver House Hotel (see TU5-12 and TU5-13 below). A grab sample of a moderate number of 19th-century artifacts was collected from this layer. B-horizon sediments were reached at 160 cm. C-horizon deposits began at 180 cm; the trench was terminated at 184 cm.

Trench 5-19

Sediments in Trench 5-19 consisted of a thin sod overlying concrete rubble fill to B-horizon sediments at 70 cm. C-horizon deposits began at 90 cm; the trench was terminated at 110 cm. No artifacts or buried cultural layer were observed.

Trench 5-20

Sediments in Trench 5-20 consisted of 10 cm of parking lot gravel, over 35 cm of gravelly fill, over 25 cm of a dark brown compact deposit – perhaps an old oiled roadbed. Below this layer, a lens of laminar fine sandy loam with no gravels extended from 70-82 cm. A buried cultural layer containing a small amount of 19th-century artifacts, likely from the Vancouver House Hotel (see TU5-12 and TU5-13 below), was located from 82-100 cm. A grab sample of five artifacts was collected from this layer. B-horizon sediments were observed beginning at 100 cm; the trench was terminated at 108 cm.

Trench 5-21

Fill sediments in Trench 5-21 consisted of 8 cm of parking lot gravels, over 26 cm of gravelly silt, over 76 cm of concrete and asphalt rubble. An artifact-rich late 19th-century cultural deposit was observed at 110 cm. A grab sample of 105 artifacts was collected from this layer. This material was likely from the Vancouver House Hotel. TU5-12 was excavated on the north side of Trench 5-21; TU5-13 was a 30 cm extension of TU5-12 to the west (see summary of these units below). Trench excavation ended at 125 cm before encountering B-horizon sediments.

SE Columbia Way Test Units

Data on the volume of sediments excavated and the number of artifacts recovered from the SE Columbia Way TUs in VNHR Area #5 are presented in Table 33.

TU5-03

TU5-03 was located to the east of the pedestrian underpass to Old Apple Tree Park in an area without magnetometer or GPR anomalies. This area was used for staging during the construction of the Land Bridge. Sediments below the sod consisted of 3 cm of a gravelly fill, over 8 cm of dark brown gravelly silt loam, over 28 cm of brown silty sand (imported dredge spoils?). B-horizon sediments were reached at 42 cm; the unit was terminated at 61 cm. Intact A-horizon deposits and the upper portion of the B horizon were missing. The entire unit was excavated to 50 cm, and then the southwest quadrant was excavated to 61 cm to confirm the presence of the sterile B horizon. A moderate number of mixed 19th- and 20th-century artifacts were found to a depth of 40 cm, within the disturbed fill strata.

TU5-04

TU5-04 was located just west of the pedestrian underpass to Old Apple Tree Park. Sediments consisted largely of undifferentiated very gravelly brown silt loam fill with pockets of sand and large chunks of concrete and other construction debris. A moderate number of mixed of 19th- and 20th-century artifacts, primarily vessel glass, were recovered. Large concrete blocks prevented excavation below 75 cm.

TU5-05

TU5-05 was excavated within backhoe Trench 5-03, 2 m from the east end of the trench. Three layers of fill, dipping 10% to the west, were removed mechanically to a depth of 62 (high end) to 72 cm (low end). Sediments below the sod consisted 28-36 cm of rocky silt loam with 70% angular gravels over 34 cm of fine sandy loam dredge spoils. These strata dipped sharply (50%) to the south within Trench 5-03 east of TU5-05. An intact stratigraphic sequence was present below the fill. The buried cultural layer from 62-82 cm contained a few late 19th- and early 20th-century historical artifacts within a dark silt loam. B-horizon deposits were reached at 82-90 cm; the unit was terminated at 92-102 cm.

TU5-06

TU5-06 was excavated within backhoe Trench 5-02, 2.3 m from the east end. This trench was located in the area of a magnetic anomaly. Two layers of fill, dipping 16% to the east, were removed mechanically to a depth of 40 cm. Sediments below the sod consisted of 38-54 cm of fine silty sand dredge spoils. An intact stratigraphic sequence was present below the silt. The 18-22 cm deep buried cultural layer contained a low concentration of prehistoric, and late 19th- and early 20th-century material to a depth of 56 cm (high end) to 76 cm (low end) within a very dark silt loam. The magnetic anomaly proved to be two 36 in. metal rods with pulleys found near the base of the dredge spoils, possibly associated with the railroad (Figure 160). Excavation was terminated within the B horizon at 63-84 cm.

TABLE 33
EXCAVATION RESULTS FOR THE NORTH SIDE OF SE COLUMBIA WAY IN VNHR AREA #5

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU5-03									
1	0-10	0.1000	39	390	-	-	29	1	-
2	10-14	0.0350	-	-	-	-	-	-	-
3	14-20	0.0600	19	317	-	-	3	-	1
4	20-30	0.1000	12	120	-	-	2	-	-
5	30-39	0.0900	4	44	-	-	1	1	1
6	39-40	0.0050	1	200	-	-	1	-	-
7	40-51	0.1050	1	10	-	-	-	-	-
8	51-53	0.0250	-	-	-	-	-	-	-
8	53-61	0.0775	-	-	-	-	-	-	-
Total		0.5975	76	127	-	-	36	2	2
TU5-04									
1	0-11	0.1100	36	327	3	-	27	2	-
2	11-20	0.0875	14	160	-	-	11	-	-
3	20-31	0.1100	22	200	-	-	20	-	-
4	31-41	0.1000	10	100	-	-	8	-	-
5	41-51	0.1000	16	160	-	--	12	-	-
6	51-61	0.1000	6	60	-	-	3	2	-
7	61-71	0.0250	3	120	-	-	1	-	-
8	71-76	0.0125	-	-	-	-	-	-	-
Total		0.6450	107	166	3	-	82	4	-
TU5-05									
1	0-67	0.6675	-	-	-	-	-	-	-
2	67-75	0.0800	10	125	5	-	1	-	-
3	75-85	0.1000	1	10	-	-	-	-	-
4	85-96	0.1125	-	-	-	-	-	-	-
Total		0.9600	11	11	5	-	1	-	-
TU5-06									
1	0-51	0.5100	-	-	-	-	-	-	-
2	51-54	0.0275	7	255	-	-	1	2	-
3	54-63	0.0900	26	289	14	3	8	-	1
4	63-74	0.1075	1	9	-	-	-	-	-
Total		0.7350	34	46	14	3	9	2	1

Continued on next page

TABLE 33
EXCAVATION RESULTS FOR THE NORTH SIDE OF SE COLUMBIA WAY IN VNHR AREA #5 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m³)	Total Artifacts	Artifacts (/m³)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU5-07									
1	0-27	0.2700	-	-	-	-	-	-	-
2	27-32	0.0500	221	4420	-	-	194	-	-
3	32-43	0.1125	214	1902	-	-	188	2	-
4	43-52	0.0850	127	1494	-	-	126	-	-
5	52-62	0.1000	43	430	-	-	43	-	-
Total		0.6175	605	980	-	-	551	2	-
TU5-08									
1	0-25	0.2525	-	-	-	-	-	-	-
2	25-29	0.0425	77	1812	7	11	7	2	-
3	29-37	0.0750	37	493	6	4	4	1	3
4	37-48	0.1050	-	-	-	-	-	-	-
Total		0.4750	114	240	13	15	11	3	3
TU5-09									
1	0-72	0.7150	-	-	-	-	-	-	-
2	72-77	0.0450	499	11089	7	6	5	88	1
3	77-88	0.1075	199	1851	1	1	9	3	5
4	88-97	0.0875	72	823	3	7	4	7	4
5	97-107	0.0975	59	605	2	4	8	9	3
6	107-115	0.0825	102	1236	2	6	20	14	-
F7, L1	115-125	0.1000	1137	11370	70	103	217	324	23
F7, L2	125-129	0.0350	881	25171	54	57	139	120	15
9	129-142	0.1300	184	1415	13	20	8	5	-
10	142-152	0.1025	48	468	3	1	-	5	-
11	152-162	0.1000	8	80	1	1	-	1	-
12	162-163	0.0125	16	1280	4	-	1	9	-
13	163-177	0.1400	109	779	24	43	-	19	3
F14, L1	175-178	0.0008	4	5333	1	-	2	-	-
14	177-180	0.0250	17	680	1	3	-	2	1
15	180-186	0.0244	23	944	1	6	1	9	-
16	186-191	0.0475	59	1242	1	7	11	12	-
17	191-202	0.0275	2	73	-	-	1	-	1
18	202-212	0.0250	1	40	-	-	-	-	-
19	212-222	0.0250	-	-	-	-	-	-	-
F15, L1	222-232	0.0250	36	1440	2	3	3	5	-
F15, L2	232-268	0.0028	12	4242	-	-	7	-	-
Total		1.9580	3468	1771	190	268	436	632	56

Continued on next page

TABLE 33
EXCAVATION RESULTS FOR THE NORTH SIDE OF SE COLUMBIA WAY IN VNHR AREA #5 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU5-10									
1	0-44	0.4400	-	-	-	-	-	-	-
2	44-48	0.0340	-	-	-	-	-	-	-
F5, L2	44-48	0.0243	435	17938	20	1	212	-	5
F5, L3	48-51	0.0340	15	442	1	-	33	52	3
4	51-55	n/a	-	-	-	-	-	-	-
F6, L1	51-55	0.0134	64	4776	1	1	12	6	-
5	55-62	0.0728	775	10653	36	15	180	97	5
6	62-70	0.0606	674	11118	38	86	159	167	3
7	70-76	0.0631	504	7994	22	14	49	312	5
8	76-88	0.1213	92	759	25	15	19	15	-
9	88-95	0.0728	-	-	-	-	-	-	-
F9, L1	36-90	0.0224	-	-	-	-	-	-	-
F9, L2	90-152	0.0258	26	1009	1	-	-	3	-
Total		0.9842	2585	2626	144	132	664	652	21
TU5-11									
1	0-18	0.1825	-	-	-	-	-	-	-
F5, L1	18-29	0.1089	220	2020	15	63	36	8	-
2	18-29	0.1089	103	946	-	-	-	-	-
F10, L1	27-89	0.0258	-	-	-	-	-	-	-
F5, L2	29-35	0.0594	215	3620	13	23	67	61	10
3	29-35	0.0594	-	-	-	-	-	-	-
F5, L3	35-37	0.0325	335	10308	1	1	251	12	1
5	37-46	n/a	-	-	-	-	-	-	-
F6, L1	37-46	0.0100	32	3200	-	4	7	1	1
6	35-40	0.0520	484	9312	15	-	89	47	2
7	40-46	0.0644	369	5734	13	28	48	101	4
8	46-55	0.0866	27	312	5	3	5	4	-
9	55-67	0.1287	11	85	2	1	3	1	1
10	67-82	0.1485	1	7	-	-	1	-	-
11	82-95	0.1312	3	23	1	-	2	-	-
Total		1.1987	1800	1502	65	123	509	235	19

Continued on next page

TABLE 33
EXCAVATION RESULTS FOR THE NORTH SIDE OF SE COLUMBIA WAY IN VNHR AREA #5 (CONT.)

Level/ Feature	Mean Depth (cm)	Volume (m^3)	Total Artifacts	Artifacts ($/m^3$)	Ceramics	Flat Glass	Vessel Glass	Nails	Other 19th-c. Artifacts*
TU5-12									
1	0-97	0.9725	1	1	1	-	-	-	-
2	97-107	0.0035	31	8857	5	2	2	-	-
F8, L1	102-110	0.0296	314	10608	73	25	88	45	10
3	107-114	0.0196	21	1071	1	-	1	2	1
F8, L2	110-120	0.0300	147	4900	21	16	55	12	8
4	114-120	0.0662	178	2691	14	14	57	-	1
5	120-127	0.0467	15	321	9	-	6	-	-
F8, L3	127-138	0.0284	9	317	1	2	-	-	-
F8, L4	138-148	0.0257	1	39	-	-	-	-	-
8	148-158	0.0270	-	-	-	-	-	-	-
Total		1.2490	717	574	125	59	209	59	20
TU5-13									
1	0-107	0.3210	-	-	-	-	-	-	-
F8, L1	107-115	0.0124	258	20848	30	11	100	43	1
F11, L1	115-118	0.0005	18	34370	1	1	4	7	1
F8, L2	118-127	0.0148	69	4662	14	11	26	6	3
F11, L2	118-127	0.0002	19	79966	3	1	5	4	1
F8, L3	127-136	0.0284	9	317	-	-	1	-	-
F8, L4	136-147	0.0285	1	35	-	-	1	-	-
8	147-157	0.0300	-	-	-	-	-	-	-
Total		0.4358	374	858	48	24	137	60	6
GRAND TOTAL		**9.8557**	**9891**	**1004**	**607**	**624**	**2645**	**1651**	**128**

*Personal and domestic items

FIGURE 160. South wall of TU5-06 at 84 cm, showing two metal rods with pulleys. (NPS 09-09:35, 4/20/09)

TU5-05 and TU5-06 were on either end of a 33 m long area from 14-47 m East on the GPR grid, which was a possible natural swale or perhaps a previous excavation/fill episode. A 1984 aerial photograph shows what appears to be a sandy pit area between the old railroad berm – which was in the process of being removed – and SE Columbia Way (Gall 2003:C-8). This feature could be the sandy fill deposit seen in these excavation units and trenches. The depth of this fill exceeded 2 m in Trench 5-04 in the center of this area.

<u>TU5-07</u>

TU5-07 was placed to test for intact cultural deposits on the east side of the sandy fill area seen in TU5-05. Fill sediments below the sod consisted of 12 cm (high end) to 27 cm (low end) of rocky silt loam with 70% angular gravels, over 13 cm (high end) to 40 cm (low end) of very dark brown silt loam. The lower fill stratum sloped to the south, and truncated B-horizon deposits from 26-48 cm and C-horizon deposits from 48-62 cm. No intact buried cultural layer was present. The high number of artifacts recovered consisted almost exclusively of modern material, which supports the speculation that this unit may be within the old roadside ditch along Columbia Way.

<u>TU5-08</u>

TU5-08 was placed to test for cultural deposits on the west side of the sandy fill area seen in TU5-05 through TU5-07. Fill sediments below the sod consisted of 12 cm of brown loamy sand with 40% angular gravels, over 10 cm of brown fine loamy sand. Strata in this unit were relatively flat, unlike those in the previous three units. An intact 5 cm dark brown silt loam cultural layer containing a moderate number of small fragments of 19th-century artifacts was present below the fill. This stratum was thin, and may have been partially removed by previous ground-disturbing activities. B-horizon sediments were reached at 35-40 cm; the unit was terminated at 54 cm.

TU5-09

TU5-09 was located in the center of backhoe Trench 5-10 when an intact buried cultural layer was observed during trench excavation. This area was near a small, unidentified structure on the 1859 Harney map (Figure 159). Approximately 70 cm of modern fill deposits were mechanically removed. Sediments below the sod consisted of 4-16 cm of brown silt fill, over 34-44 cm of dark brown gravelly silt loam, over 20 cm of brown fine loamy sand dredge spoils. A series of intact, artifact-rich historical fill deposits was present below 70 cm.

TU5-09 appeared to be within a deep historical intrusion such as a privy or cellar. The latter seems more likely, since the strata were relatively flat, dipping about 10% to the south, rather than at a steeper angle that might be expected in a more confined space. Eleven distinct strata and at least two separate depositional episodes were identified. The entire unit was excavated to 190 cm. The northwest quadrant was further excavated to 230 cm, and then an auger probe was dug at the bottom of the quadrant to 266 cm. The B-horizon subsoil was not reached before further excavation became impracticable. The upper three Stratum IIb cultural layers from about 5-70 cm included both prehistoric and early 20th-century artifacts. The Stratum IIa layers below about 85 cm contained only 19th-century artifacts. These objects include entire, fragile items, which suggest that they had not been disturbed since deposition (Figure 161).

FIGURE 161. TU5-09 at the base of Feature 7 Level 1, at 134 cm. Artifacts in this level included a spoon, shoe, buttons, bone domino, and lithic debitage; and fragments of transferprinted ceramic, whiteware, mochaware, stoneware, Chinese porcelain, clay pipe, cloth, shoe leather, porcelain doll, square nails, cans, and English brick. (NPS 09-09:108, 4/29/09)

Three features were observed. Feature 7 was an artifact-dense primary 19th-century midden deposit within a black silt loam from 110-134 cm. Feature 14 was a wood plank fragment located from 176-178 cm. Feature 15 was a second primary 19th-century midden deposit within a very dark grayish brown silt loam, from 216 to at least 266 cm. Stratum IIa5, with an irregular, wavy boundary, dipped sharply to the south (possible flood episode?) from 160-188 cm.

<u>TU5-10 and TU5-11</u>

TU5-10 was placed within backhoe Trench 5-09, 1.5 m from the east end, when an intact buried cultural layer was observed during trench excavation. This area was near a small, unidentified structure on the 1859 Harney map. TU5-11, a continuation of TU5-10 to the north, further explored features extending beyond the trench and unit. Mechanically removed fill deposits below the sod consisted of 8 cm of gravelly silty loam over 17 cm of fine silty sand. Fill deposits were shallower in TU5-11 to the north. Intact historical fill deposits were observed beginning at approximately 30 cm; the top few cm of this cultural layer were inadvertently stripped off in TU5-10. Sediments dipped slightly to the south and appear to be partially truncated on the north half of TU5-11.

The upper cultural deposit in these units was designated Feature 5. Feature 5 Level 1, from approximately 35-50 cm in TU5-10 (from 20-50 cm in TU5-11) consisted of a dense concentration of prehistoric and 19th-century artifacts within gravelly very dark grayish brown silt loam. This stratum appeared somewhat mixed or redeposited. Feature 5 Level 2 appeared intact, and consisted of 19th-century artifacts within very dark brown charcoal-rich silt loam, from 50-55 cm. These two feature levels probably represented the same depositional event, differentiated only by the amount of disturbance in the upper portion of Feature 5 Level 1. Unit levels at the base of Feature 5 contained a dense deposit of 19th-century artifacts surrounding and pressed into a concentration of large cobbles sitting on a thin bed of small rounded gravels (C horizon). These strata may be the product of the same depositional event seen in TU5-09, located 4 m to the south. B-horizon sediments dipped to the south, beginning at 32 cm in the north half of TU5-11, 63 cm in the south half of TU5-11, and largely missing or mixed in TU5-10. C-horizon sediments likewise dipped, beginning at 45 cm in the north half of TU 5-11 dipping to 75 cm in TU5-10. The units were terminated within C-horizon deposits at 90 cm.

Four features were observed in TU5-10 and TU5-11. Feature 5 was the artifact-rich 19th-century midden deposit. Feature 6 consisted of wood elements, possibly a flattened wood crate, from 49-51 cm within Feature 5. Feature 9 (TU5-10) and Feature 10 (TU5-11) were postholes spaced 4 ft. apart that may be associated with the railroad trestle and berm that were in this location from about 1906 until the early 1980s. Features 9 and 10 were first visible at about 30 cm and extended beyond the base of excavations. The features were intrusive into the buried historical deposits, and could be seen to have deformed those strata downward.

TU5-12 and TU5-13

TU5-12 and TU5-13 were excavated in the area of a structure determined to be the Vancouver House Hotel, present on the 1874 Ward map (Figure 162). The 1888 Sanborn fire insurance map shows the hotel located just south of First Street between Main and West Reserve Streets (Figure 163). The City of Vancouver was laid out on a north/south grid, whereas the U.S. Army Military Reserve, originally HBC land, was oriented to the Columbia River. The Vancouver House Hotel was located on a small wedge-shaped block (Block 2) where the two grids met at the river. Two boundary lines for West Reserve Street can be seen on the east side of the hotel on the Sanborn map. There was apparently a boundary dispute between the City of Vancouver and the U.S. Army concerning the location of the west edge of West Reserve Street. The 1884 and 1888 Sanborn maps show the hotel intact, but the 1890 and 1892 maps show that the Army won: the street was widened and the hotel was truncated. The 1907 Sanborn map shows that the hotel was destroyed during the construction of the railroad – all that remained was a small shed.

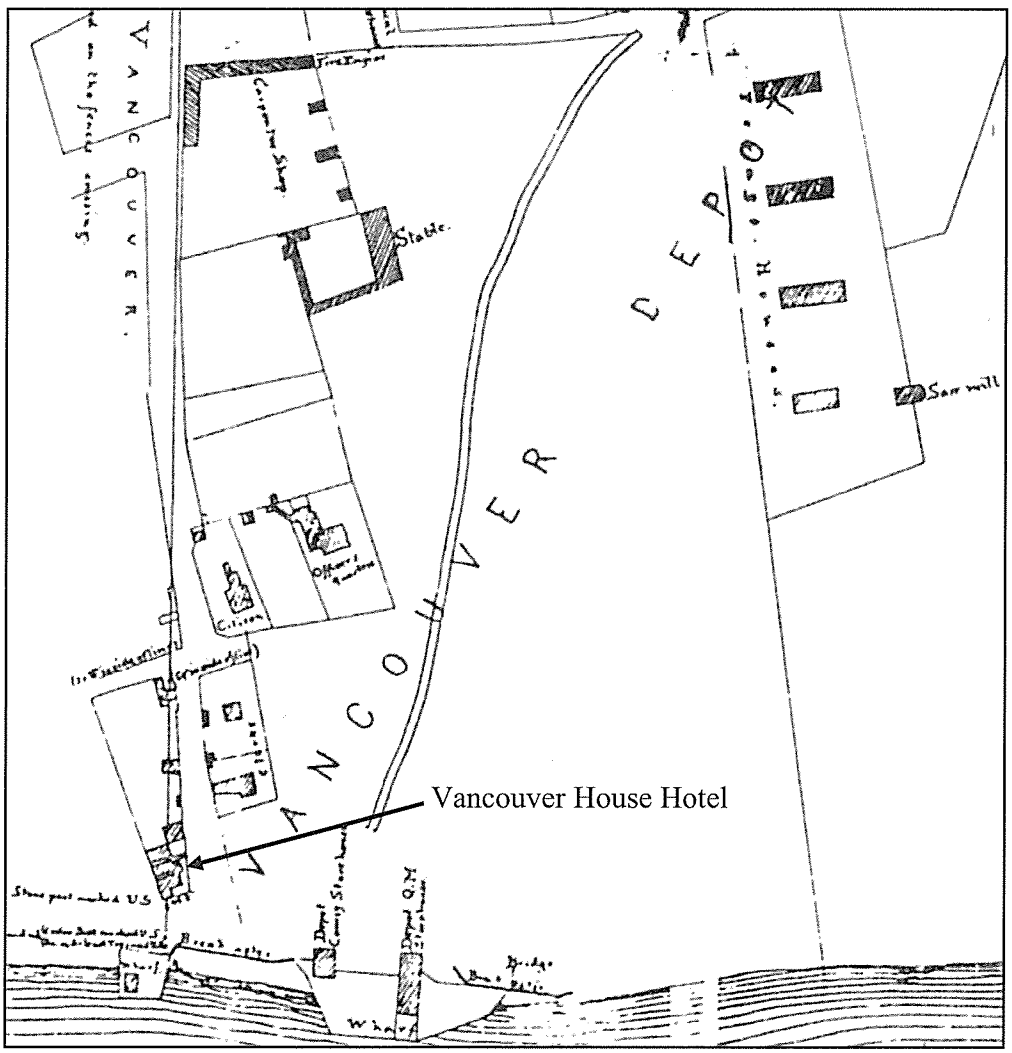

FIGURE 162. Detail of the 1874 Ward map showing the Vancouver House Hotel on the west side of West Reserve Street.

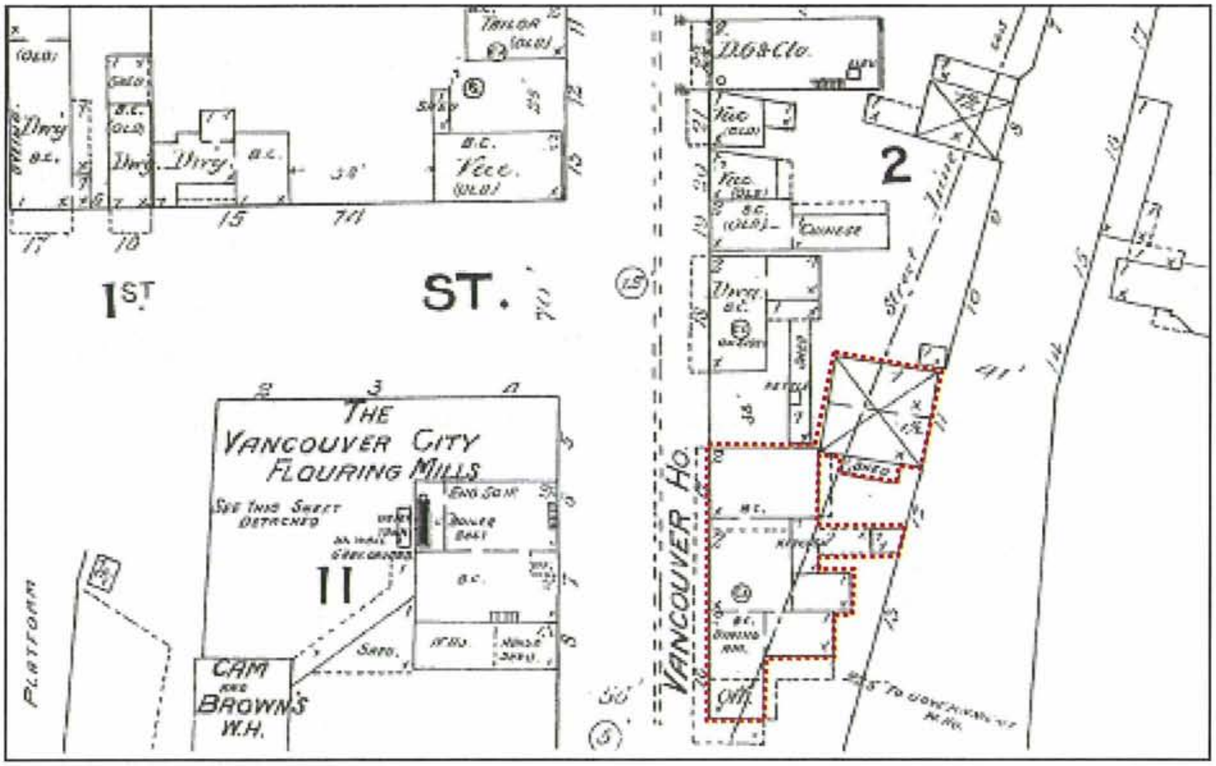

FIGURE 163. Detail of the 1888 Sanborn fire insurance map showing the Vancouver House Hotel (red) between Main and West Reserve streets.

TU5-12 was placed on the north edge of Trench 5-21 where a dense deposit of 19th-century artifacts was observed during trench excavation. Fill sediments below parking lot gravels consisted of 26 cm of gravelly silt, over 76 cm of concrete and asphalt rubble. The top 83-100 cm of compact fill was removed with the backhoe; the remaining 20 cm was removed by hand. The artifact-rich late 19th-century cultural layer, present from about 100-133 cm, appeared to be a midden associated with the Vancouver House Hotel. This layer, designated Feature 8, consisted of very dark brown clay loam with numerous multicolored smooth rounded pebbles, which has been observed in other similar cultural deposits of this time period elsewhere on the VNHR. A modern utility trench truncating Feature 8 on the eastern side of the unit was observed at 100 cm and was excavated to 126 cm. This utility trench, designated Feature 11, predated the fill deposit capping the historical surface. B-horizon sediments were reached at 144-157 cm; the unit was terminated at 180-185 cm.

TU5-13 was a 1 m x 30 cm western extension of TU5-12 in backhoe Trench 5-21 to further explore the extent of Feature 8 (the 19th-century cultural layer) in the adjacent unit. The high concentration of 19th-century artifacts continued into TU5-13 and was also visible in backhoe Trench 5-21 to the south. Feature 11, a circular depression approximately 60 cm in diameter, was present on the west side of the unit at 112 cm. Feature 11 appeared to be a modern disturbance, probably a post or posthole, and was intrusive into Feature 8. The base of Feature 11 was reached at 133 cm; the unit was terminated at 185 cm.

ANALYSIS RESULTS

Through the review of historical documents and maps, previous archaeological studies, the Fort Vancouver National Historic Site GIS database, and the results of geophysical surveys and archaeological field investigations, three cultural resources were identified in VNHR Area #5 within the CRC APE: 1859 U.S. Army Building, 1874 Vancouver House Hotel, and 1826 Old Apple Tree. No other significant resources were located, although undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to 19th-century structures, may still exist below fill layers in VNHR Area #5 within the CRC APE.

Old Apple Tree Park

1826 Old Apple Tree

The 1826 Old Apple Tree is located in the northeast corner of Old Apple Tree Park. The tree itself is not located within the CRC APE, and no archaeological excavations were conducted in its vicinity. Potential impacts to the tree from the CRC project consist mainly of changes in the surroundings from an airspace easement for a proposed freeway ramp. It is anticipated that these changes will have no direct adverse effect on this historical resource.

SE Columbia Way

1859 U.S. Army Building

Historical artifacts and features from an unidentified U.S. Army building located on the north side of SE Columbia Way in VNHR Area #5, which appears on the 1859 Harney map, were encountered in TU5-9, TU5-10, and TU5-11; and in Trench 5-09 and Trench 5-10. The purpose of this building is not known, but the high density of 19th-century domestic artifacts recovered from these units suggests that this was the location of an Early U.S. Army-period house.

Six features associated with the 1859 U.S. Army Building were found in TU5-09, TU5-10, and TU5-11. In TU5-09, Feature 7 is the artifact-rich upper midden deposit of 19th-century artifacts, Feature 14 consists of wood elements located below the upper midden deposit, and Feature 15 is a lower midden deposit within a deep cellar or privy, extending to a depth of over 265 cm (Figure 164, see also Figure 161).

In TU5-10 and the adjoining TU5-11, located 4 m north of TU5-09, Feature 5 is a dense midden deposit rich in 19th-century artifacts (Figure 165). Feature 5 shows the same types of historical artifacts as in the upper midden deposit (Feature 7) in TU5-09. It is hypothesized that these two features could be from the same depositional event. Feature 6 consists of wood elements within Feature 5.

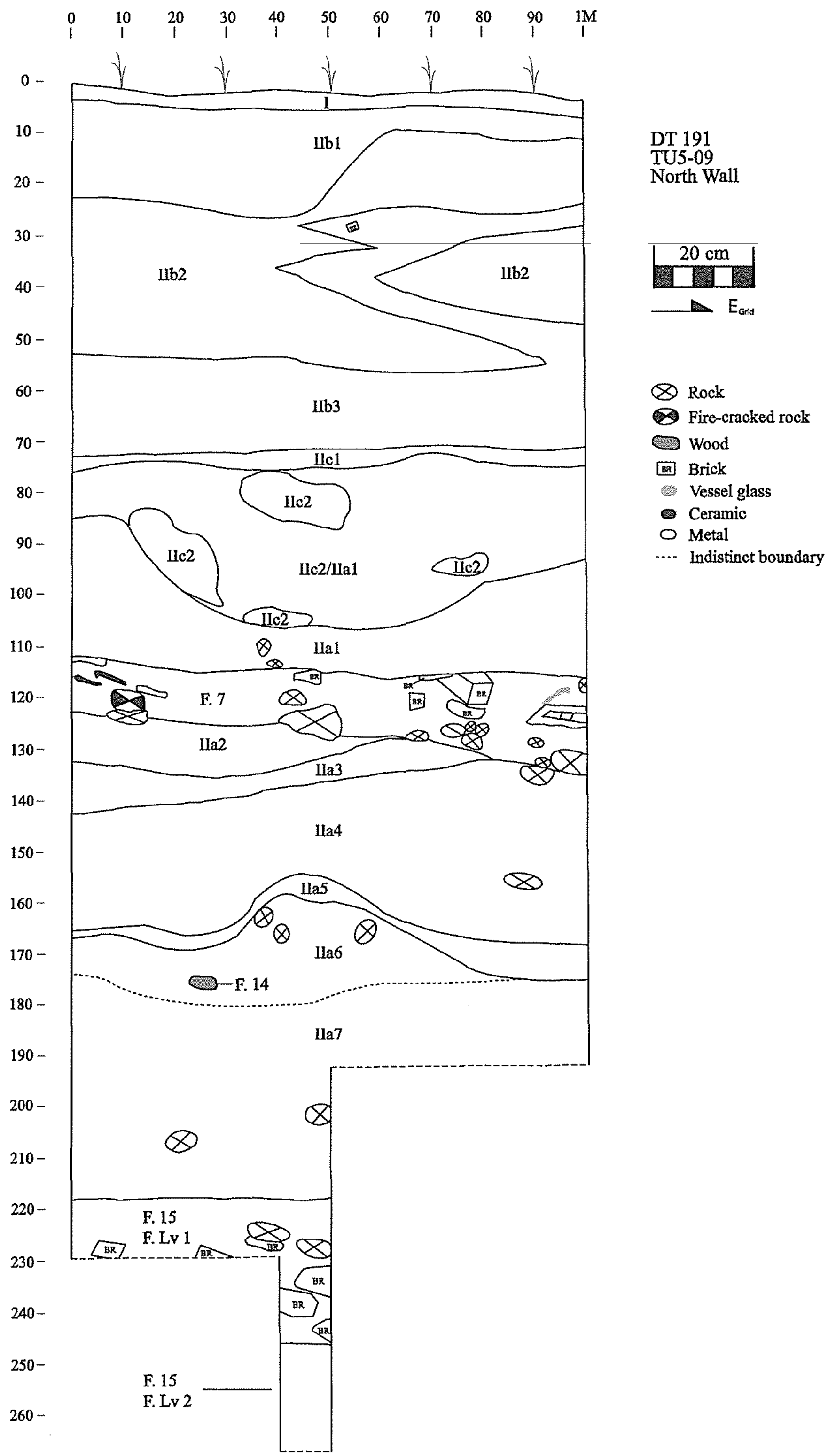

FIGURE 164. North wall profile of TU5-09 on the north side of SE Columbia Way, showing the deep cellar or privy and Features 7, 14, and 15. (NPS 2010)

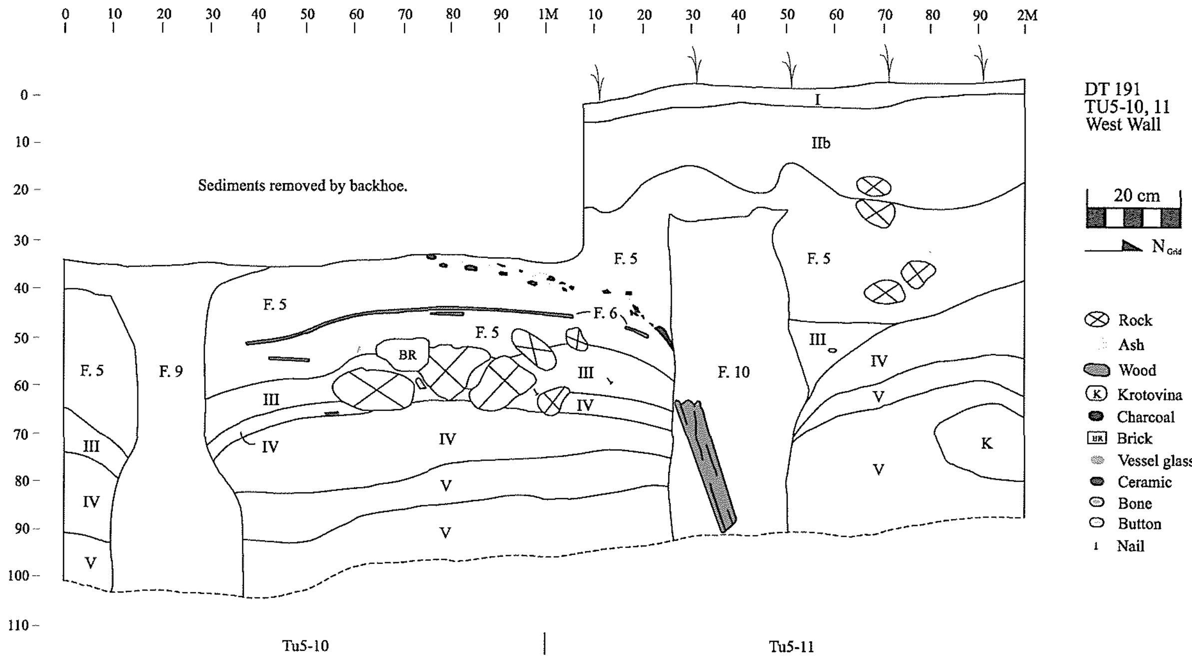

FIGURE 165. Profile of the west wall of TU5-10 and TU5-11 on the north side of SE Columbia Way, showing Features 5, 6, 9, and 10. (NPS 2010)

Two 20th-century features were also observed in TU5-10 and the adjoining TU5-11 (Figure 165). Features 9 and 10 were two large postholes, assumed to be associated with the railroad line that was previously located in this area.

The cultural material associated with these units consists predominantly of 19th-century artifacts. A typological classification of these objects is presented in Table 34. Modern artifacts that are not included in Table 34 include concrete, linoleum, and modern debris. These items largely constitute the difference seen between the total artifacts recovered from the 1859 U.S. Army Building TUs in the volumetrics table (Table 33), and the number of artifacts from these units in the typology table.

More than 34% (n=2739) of the artifact assemblage in Table 34 consists of architectural material, including all varieties of square nails (18.1%, n=1438), flat glass (6.6%, n=524), and brick (3.9%, n=311). The diversity of architectural items seen here is not present in other locations tested for the CRC project. These items include coal, mortar, screws, sheet metal, tile, wire, and wood.

TABLE 34
CHARACTERISTICS OF ARTIFACTS AT THE 1859 U.S. ARMY BUILDING

OBJECT	Sprague (1981) Typology	Number	Percent
Personal Items			
Button	I.A	9	0.11
Button, 2-Holed	I.A	1	0.01
Button, 4-Holed	I.A	6	0.08
Button, Ball	I.A	2	0.03
Button, Back	I.A	2	0.03
Grommet	I.A	6	0.08
Leather	I.A	3	0.04
Shoe Leather and Parts	I.A	41	0.52
Metal Disc/Possible Button	I.A	8	0.10
Rubberized Textile Fabric	I.A	16	0.20
Bead, Drawn	I.C	3	0.04
Pendant	I.C	1	0.01
Bottle, Cosmetic	I.D	1	0.01
Comb	I.D	1	0.01
Comb Teeth	I.D	1	0.01
Jar, Ointment	I.D	1	0.01
Toothbrush Head	I.D	4	0.05
Bottle, Alcohol	I.G	173	2.18
Bottle, Beer	I.G	4	0.05
Bottle, Champagne	I.G	11	0.14
Pipe, Tobacco	I.G	47	0.59
Domino	I.H	1	0.01
Harmonica Parts	I.H	18	0.23
Total		**360**	**4.5%**
Domestic Items			
Metal Plate	II.B	110	1.38
Rim of Metal Tub	II.B	10	0.13
Bone, Butchered	II.B.2	194	2.44
Bone, Unworked	II.B.2	1476	18.57
Bottle, Condiment	II.B.2	1	0.01
Bottle, Food	II.B.2	4	0.05
Bottle, Spice	II.B.2	1	0.01
Earthenware	II.B.2	104	1.31
Earthenware, Transferprinted	II.B.2	44	0.55
Glassware Sherd	II.B.2	214	2.69
Ironstone	II.B.2	170	2.14
Ironstone, Transferprinted	II.B.2	2	0.03
Porcelain	II.B.2	41	0.52

Continued on next page

TABLE 34
CHARACTERISTICS OF ARTIFACTS AT THE 1859 U.S. ARMY BUILDING (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Domestic Items (cont.)			
Shell	II.B.2	42	0.53
Spoon	II.B.2	1	0.01
Stoneware	II.B.2	38	0.48
Tumbler	II.B.2	2	0.03
Lamp Glass	II.B.3	8	0.10
Wash Boiler	II.C.3	43	0.54
Wash Tub Fragments	II.C.3	39	0.49
Total		**2544**	**32.0%**
Architecture			
Brick	III.B.1	311	3.91
Brick, American	III.B.1	1	0.01
Brick, English	III.B.1	1	0.01
Flat Glass	III.B.1	524	6.59
Mortar	III.B.1	11	0.14
Plaster/Mortar	III.B.1	1	0.01
Wood, Burned	III.B.1	1	0.01
Wood, Worked	III.B.1	3	0.04
Metal Ring/Washer	III.B.2	1	0.01
Metal Staple	III.B.2	1	0.01
Metal Wire	III.B.2	29	0.36
Nail, Machine-Cut	III.B.2	74	0.93
Nail, Machine-Cut American	III.B.2	20	0.25
Nail, Square	III.B.2	939	11.81
Nail, Unidentified	III.B.2	393	4.94
Nail, Wire	III.B.2	58	0.73
Nail, Wrought	III.B.2	6	0.08
Screw	III.B.2	3	0.04
Sheet Metal	III.B.2	50	0.63
Tack, Square	III.B.2	6	0.08
Tack, Wire	III.B.2	23	0.29
Tile	III.B.2	142	1.79
Coal	III.E	140	1.76
Slag	III.E	1	0.01
Total		**2739**	**34.5%**

Continued on next page

TABLE 34
CHARACTERISTICS OF ARTIFACTS AT THE 1859 U.S. ARMY BUILDING (CONT.)

Object	Sprague (1981) Typology	Number	Percent
Commerce and Industry			
Bullet	V.B or VI.B.4	1	0.01
Cartridge Fragment	V.B or VI.B.4	2	0.03
Percussion Cap	V.B or VI.B.4	2	0.03
Folding Ruler	V.H.1	28	0.35
Bottle, Medicine	V.J.6.b	28	0.35
Total		**61**	**0.8%**
Group Services			
Button, Military	VI.B.4	1	0.01%
Sewer Tile	VI.E	1	0.01%
Total		**2**	**0.03%**
Unknown			
Cloth	VIII	1	0.01
Coral	VIII	1	0.01
Pen Tip	VIII	2	0.03
Pencil Lead	VIII	2	0.03
Slate	VIII	4	0.05
Bow of Skeleton Key	VIII.A	1	0.01
Brass Fragments	VIII.A	2	0.03
Copper Fragments	VIII.A	6	0.08
Copper Sheet Metal	VIII.A	2	0.03
Copper Wire	VIII.A	1	0.01
Cupreous Fragment	VIII.A	1	0.01
Flat Metal Fragments	VIII.A	3	0.04
Iron Bar Fragments	VIII.A	8	0.10
Iron Bar or Strap	VIII.A	11	0.14
Lead Fragments	VIII.A	56	0.70
Unidentified Copper Object	VIII.A	7	0.09
Unidentified Iron Artifact	VIII.A	3	0.04
Unidentified Metal Artifact	VIII.A	24	0.30
Metal Can Fragments	VIII.A	401	5.04
Metal Fragments	VIII.A	503	6.33
White Metal Fragments	VIII.A	43	0.54
Bottle Glass	VIII.B	396	4.98
Glass Sherd	VIII.B	765	9.62
Total		**2243**	**28.2%**
GRAND TOTAL		**7949**	

The large quantity and variety of domestic artifacts (32%, n=2544) includes a large amount of unworked bone (18.6%, n=1476), ceramics (5%, n=399), glassware (2.7%, n=214), plate metal (1.4%, n=110), and wash boiler fragments (1%, n=82). The butchered bone (2.4%, n=194) is from deer/sheep or larger-sized animals. One fragment of a Chinese porcelain ginger jar lid was recovered (Figure 166).

Personal artifacts constitute 4.5% (n=360) of the assemblage and show a similar diversity. The most abundant personal artifacts include fragments of alcohol bottles (2.4%, n=188) and tobacco pipes (0.6%, n=47) (Figure 167), with lesser numbers of leather, fabric, grooming items, and jewelry (Figures 168-169). Buttons include one of wound glass (Figure 170), and two military buttons (Figures 171-172). A metal toy dish and domino were also recovered (Figure 173). Other personal artifacts include fragmented remains of a bone toothbrush head, comb, and harmonica. Items recovered whose function could not be determined (28.2%, n=2243) are mainly metal and glass, including glass sherds, bottle glass, metal fragments, and metal can fragments.

FIGURE 166. Chinese porcelain ginger jar lid from TU5-09, Feature 7, Level 1, at the 1859 U.S. Army Building in VNHR Area #5. (NPS 09-17:43, 12/17/09)

The mean dates for the ceramic sherds recovered at the 1859 U.S. Army Building (n=399) show a bimodal distribution, with similar numbers of artifacts dating from ca. 1845 and ca. 1875 (Figure 174). Ceramic types with a mean date of ca. 1845 (n=195) are predominantly white earthenware (46%, n=89) and transferprinted earthenware (19%, n=37), with lesser quantities of English and Chinese stoneware (n=27), English and Chinese porcelain (n=22), and other types of earthenware (n=20). This mean date and these ceramic types are consistent with the HBC period at Fort Vancouver. Ceramic types with a mean date of ca. 1875 (n=165) are predominantly ironstone (88%, n=146), with English porcelain (11%, n=18) and one piece of white earthenware. This mean date and these ceramic types are consistent with the Early U.S. Army period at Fort Vancouver. Fragments of English porcelain include doll parts and toy dishes (n=9) with mean ceramic dates of 1845 and 1875.

FIGURE 167. Clay tobacco pipe fragments: two stem fragments from the 1859 U.S. Army Building (the embossed "F" for Ford Stepney); and two bowl fragments from Vancouver House Hotel (the embossed "D" is for Dumeril). (NPS 09-17:294, 12/17/09)

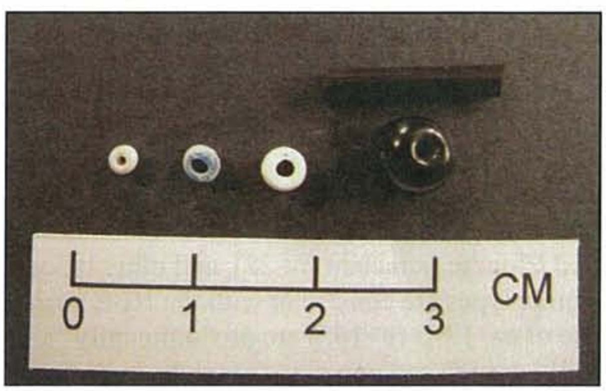

FIGURE 168. Beads from the 1859 U.S. Army Building and Vancouver House Hotel excavation units in VNHR Area #5. (NPS 09-17:1612, 12/17/09)

FIGURE 169. Portion of an inlaid glass bead or pendant from TU5-09 at the 1859 U.S. Army Building in VNHR Area #5. (NPS 09-17:64, 12/14/09)

9658

FIGURE 170. Wound glass button, front (left) and back (right), from TU5-09 at the 1859 U.S. Army Building in VNHR Area #5. (NPS 09-17:1194, 12/14/09)

FIGURE 171. Ca. 1820-1840 military button from TU5-10 at the 1859 U.S. Army Building in VNHR Area #5. (NPS 10-01:19, 4/16/10)

FIGURE 172. Left: Georgia State Seal Civil War-era button from TU5-09 at the 1859 U.S. Army Building in VNHR Area #5 (NPS 10-01:83, 4/19/10). Right: Georgia State Seal button (Albert 1977:133).

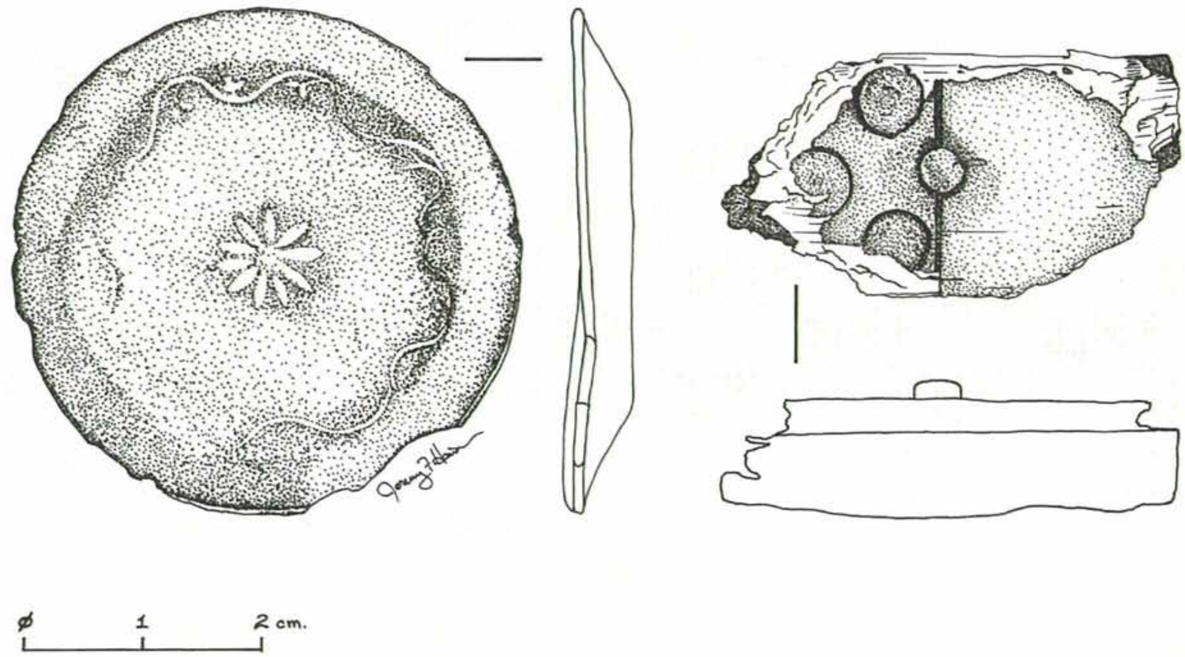

FIGURE 173. Metal toy dish (left) and bone domino (right) fromTU5-09 at the 1859 U.S. Army Building in VNHR Area #5. Illustrations by Jeremy Harrison.

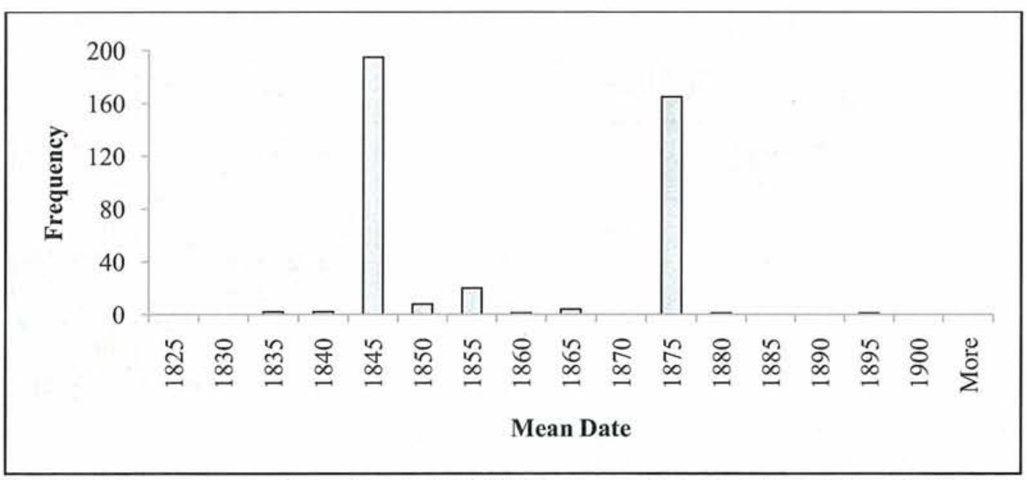

FIGURE 174. Mean ceramic dates for the 1859 U.S. Army Building (σ=14.9). (NPS 2010)

The window glass thickness of the total number of fragments at the 1859 U.S. Army Building (n=524) has a primary mode of 0.075 in. (n=174), which corresponds to a date range of 1850-1865 (Figure 175). This mode is compatible with the presumed date of this building, seen only on the 1859 Harney map, and the Early U.S. Army period at Fort Vancouver. The large number of window glass fragments with a thickness of 0.055 in. or less (n=240) is suggestive of the earlier Hudson's Bay Company use of this portion of the Columbia River waterfront.

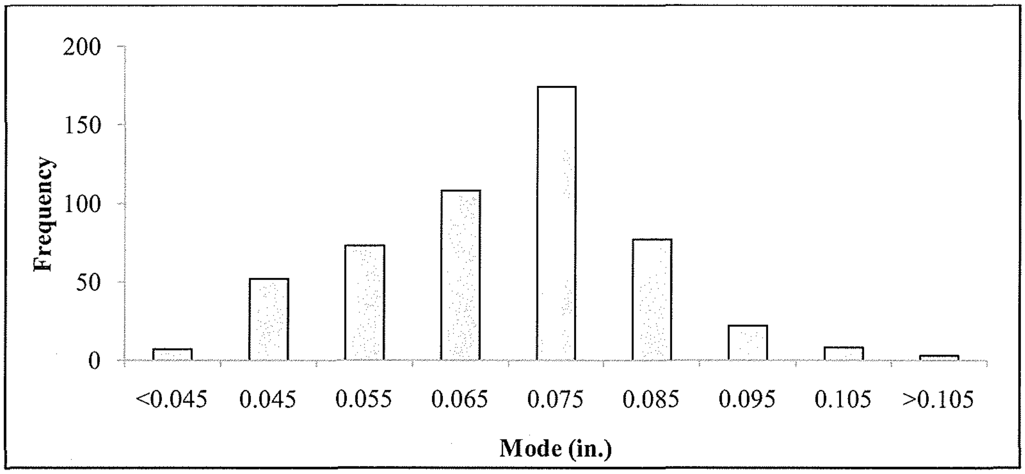

FIGURE 175. Window glass thickness at the 1859 U.S. Army Building. (NPS 2010)

The majority of the total number of vessel glass fragments from the 1859 U.S. Army Building (n=1609) show no temporally diagnostic attributes (n=1163). There is a large number of fragments made by methods that typically date from before 1900 (n=446, or 27.7% of all vessel glass fragments). Among these pre-1900 fragments, 407 fragments are from blown-into-mold vessels, 15 fragments are from turn mold vessels, 13 fragments are free blown, and 11 fragments are blown. Two complete 19th-century blown-into-mold bottles were recovered from the 1859 U.S. Army Building TUs (Figures 176-177).

The assemblage of nails recovered at the 1859 U.S. Army Building (n=1519) has a strong bias toward the square types (Figure 178). The total number of all varieties of square nails (94.7%, n=1438) far outweighs the number of wire nails (n=81). These findings support the pre-1900 construction of this building, and provide further evidence that this building was probably short-lived and did not undergo any renovation or remodeling in the 20th century.

The temporally diagnostic artifacts recovered from the 1859 U.S. Army Building excavation units (n=2888) consist mainly of 19th-century material (96.8%, n=2796) (Figure 179). The abundance and variety of 19th-century ceramic artifacts (5.2%, n=399), and other domestic and personal items (31.5%, n=2505), suggests that this was the location of a domestic structure; however the 1859 Harney map provides no clue to who might have lived here. The large quantity and diversity of artifacts found across all classes, including children's ceramic and metal toys, suggests that something unique is going on at this location. The richness of the artifact assemblage, together with the deep cellar or privy feature associated with the building, provides a rare opportunity to study the 1850-1860s transition period from the HBC's Fort Vancouver to the Early U.S. Army's Vancouver Barracks.

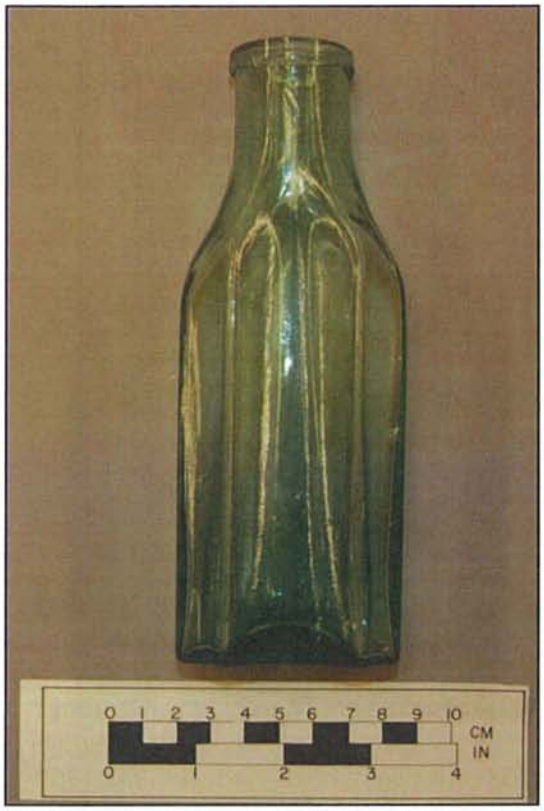

FIGURE 176. Complete blown-into-mold aqua spice bottle from TU5-09 at the 1859 U.S. Army Building in VNHR Area #5. (NPS 09-17:2307, 12/15/09)

FIGURE 177. Complete blown-into-mold light green medicine bottle from TU5-10 at the 1859 U.S. Army Building in VNHR Area #5. (NPS 09-17:19, 12/16/09)

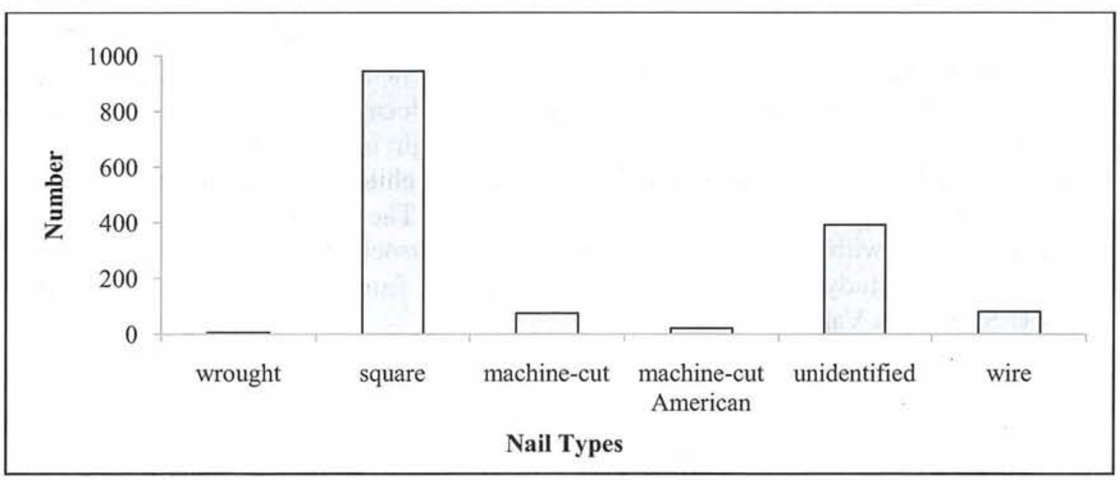

FIGURE 178. Nail types at the 1859 U.S. Army Building. (NPS 2010)

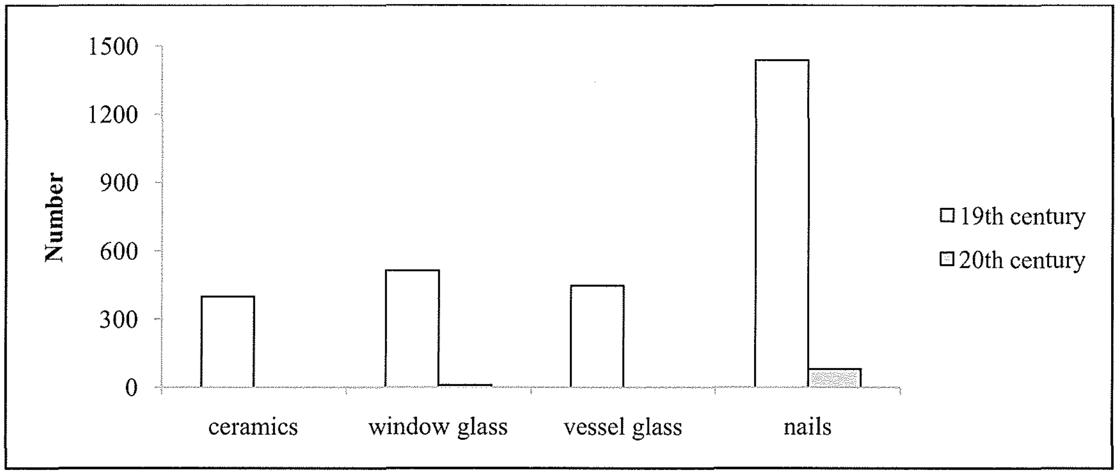

FIGURE 179. Distribution of temporally diagnostic artifacts at the 1859 U.S. Army Building. (NPS 2010)

1874 Vancouver House Hotel

Historical artifacts from the ca. 1874-1906 Vancouver House Hotel, located on the north side of SE Columbia Way in VNHR Area #5, were encountered in TU5-12, TU5-13, and Trench 5-21. This deposit likely represents a midden associated with the hotel, perhaps from the alteration of the west side of the hotel from 1888-1890, or from the demolition of the structure in 1906 to make way for the railroad.

Two features were observed in TU5-12 and TU5-13. Feature 8 in TU5-12 is the midden associated with Vancouver House Hotel, which contains a rich assemblage of 19^{th}-century artifacts. Feature 11 in TU5-12 and TU5-13 consists of a modern utility trench and remnants of a post assumed to be associated with the railroad (Figure 180).

The cultural material associated with these units consists predominantly of 19^{th}-century artifacts. A typological classification of these objects is presented in Table 35. Modern artifacts that are not included in Table 35 include asphalt and modern debris. These items largely constitute the difference seen between the total artifacts recovered from Vancouver House Hotel TUs in the volumetrics table (Table 33), and the number of artifacts from these units in the typology table.

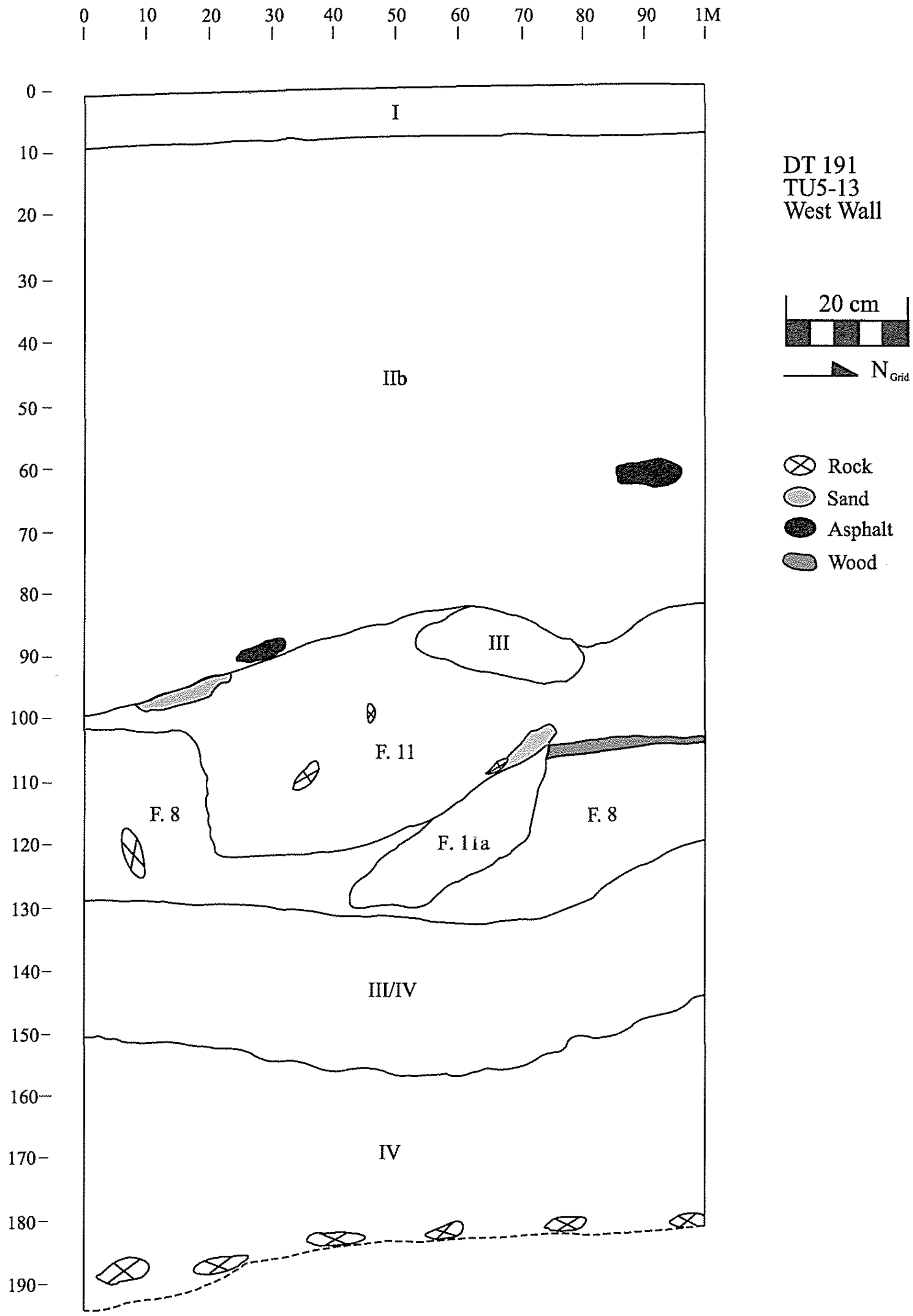

FIGURE 180. West wall profile of TU5-13, showing Features 8 and 11. (NPS 2010)

TABLE 35
CHARACTERISTICS OF ARTIFACTS AT THE 1874 VANCOUVER HOUSE HOTEL

Object	Sprague (1981) Typology	Number	Percent
Personal Items			
Button	I.A	1	0.09
Button, 4-Holed	I.A	2	0.18
Button, Molded	I.A	1	0.09
Leather	I.A	3	0.27
Bead, Drawn	I.C	2	0.18
Comb	I.D	1	0.09
Vaseline Jar	I.D	1	0.09
Bottle, Alcohol	I.G	22	2.01
Bottle, Beer	I.G	3	0.27
Pipe, Tobacco	I.G	20	1.83
Total		**56**	**5.1%**
Domestic Items			
Bone, Butchered	II.B.2	16	1.46
Bone, Unworked	II.B.2	148	13.52
Earthenware	II.B.2	41	3.74
Earthenware, Transferprinted	II.B.2	67	6.12
Glassware Sherd	II.B.2	1	0.09
Ironstone	II.B.2	71	6.48
Ironstone, Transferprinted	II.B.2	1	0.09
Porcelain	II.B.2	4	0.37
Shell	II.B.2	5	0.46
Tumbler	II.B.2	14	1.28
Total		**368**	**33.6%**
Architecture			
Brick	III.B.1	32	2.92
Flat Glass	III.B.1	83	7.58
Mortar	III.B.1	2	0.18
Nail, Machine-Cut	III.B.2	17	1.55
Nail, Square	III.B.2	95	8.68
Nail, Unidentified	III.B.2	4	0.37
Nail, Wire	III.B.2	9	0.82
Screw	III.B.2	1	0.09
Tack, Square	III.B.2	2	0.18
Coal	III.E	22	2.01
Total		**267**	**24.4%**

Continued on next page

TABLE 35
CHARACTERISTICS OF ARTIFACTS AT THE 1874 VANCOUVER HOUSE HOTEL (CONT.)

OBJECT	Sprague (1981) Typology	Number	Percent
Commerce and Industry			
Glass Finial	V.J.1	1	0.09
Bottle, Medicine	V.J.6.b	3	0.27
Total		**4**	**0.5%**
Group Services			
Sewer Tile	VI.E	**1**	**0.1%**
Unknown			
Lynch Pin	VIII	1	0.09
Unidentified Metal Artifact	VIII.A	92	8.40
White Metal Fragments	VIII.A	1	0.09
Bottle Glass	VIII.B	138	12.60
Glass Sherd	VIII.B	167	15.25
Total		**399**	**36.4%**
GRAND TOTAL		**1095**	

More than 33% (n=368) of the artifact assemblage in Table 35 consists of domestic artifacts, dominated by ceramics (16.8%, n=184) and unworked bone (13.5%, n=148). The butchered bone (1.5%, n=16) is from deer/sheep or larger-sized animals. Architectural material (24.4%, n=267) includes all varieties of square nails (10.8%, n=118), flat glass (7.6%, n=83), and brick (2.9%, n=32). A variety of personal artifacts (5.1%, n=56) are present, predominantly fragments of alcohol bottles (2.3%, n=25) and tobacco pipes (1.8%, n=20), with lesser numbers of buttons, grooming items, jewelry (Figure 168), and leather. One tobacco pipe fragment had an embossed "D" for the French company Dumeril (Figure 167). Items recovered whose function could not be determined (36.4%, n=399) are mainly glass and metal, including glass sherds, bottle glass, and unidentified metal artifacts.

The mean dates for the ceramic sherds recovered at Vancouver House Hotel (n=184) show a bimodal distribution, with similar numbers of artifacts dating from ca. 1845 and ca. 1875 (Figure 181). Ceramic types with a mean date of ca. 1845 (n=51) are predominantly transferprinted earthenware (45%, n=23) and white earthenware (25%, n=13), with lesser quantities of yellow ware (21.6%, n=11), and English and Chinese porcelain (8%, n=4). This mean date and these ceramic types are consistent with the HBC period at Fort Vancouver. Ceramic types with a mean date of ca. 1875 (n=55) are predominantly ironstone (98%, n=54), with one piece of transferprinted earthenware. This mean date and these ceramic types are consistent with the early days of operation of the 1874 Vancouver House Hotel.

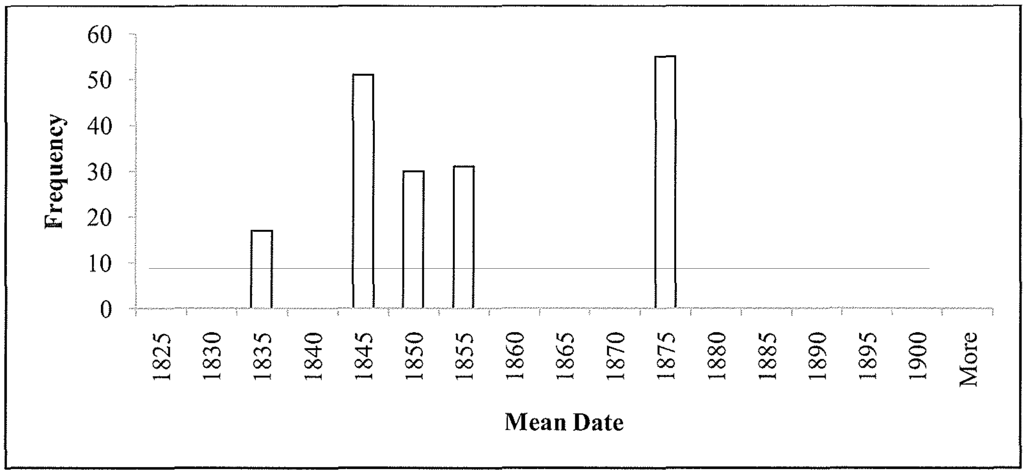

FIGURE 181. Mean ceramic dates at Vancouver House Hotel (σ=14.0). (NPS 2010)

The window glass thickness of the total number of fragments at the Vancouver House Hotel (n=83) appears bimodal, with 21 fragments at a mode of 0.055 in. corresponding to a pre-1845 date range, and 26 fragments at a mode of 0.075 in. corresponding to a 1850-1865 date range (Figure 182). These modes are both well within the pre-1874 construction date for Vancouver House Hotel.

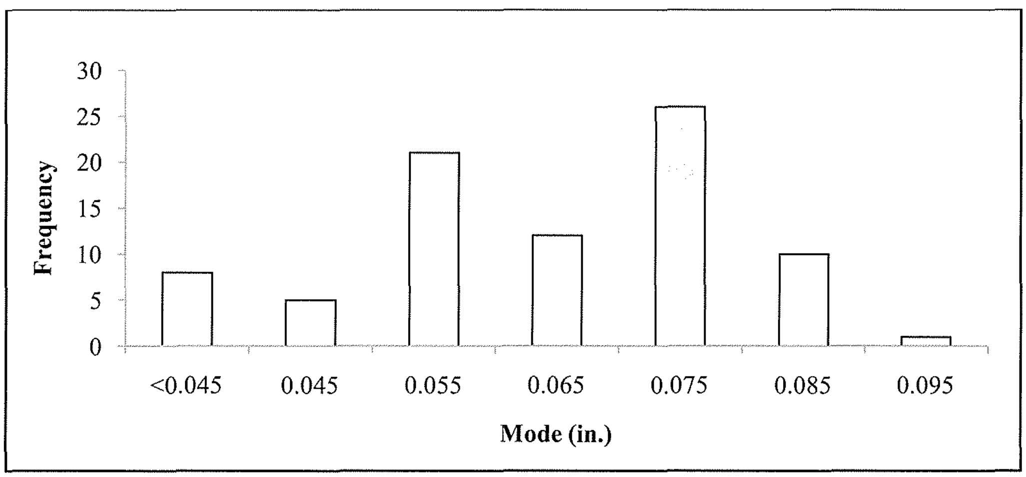

FIGURE 182. Window glass thickness at Vancouver House Hotel. (NPS 2010)

The majority of the total number of vessel glass fragments from Vancouver House Hotel (n=353) show no temporally diagnostic attributes (n=280). There are many vessel glass fragments made by blown, or by blown-into-mold methods (n=72, or 20.4% of all vessel glass fragments), which typically date from before 1900. One fragment is machine-made.

The assemblage of nails recovered at Vancouver House Hotel (n=127) has a strong bias toward the square types (Figure 183). The total number of all varieties of square nails (92.9%, n=118) far outweighs the number of wire nails (n=9). These findings support the pre-1874 construction date, and suggest that this building did not undergo any renovation or remodeling during the few years in the 20th century that it stood before being demolished.

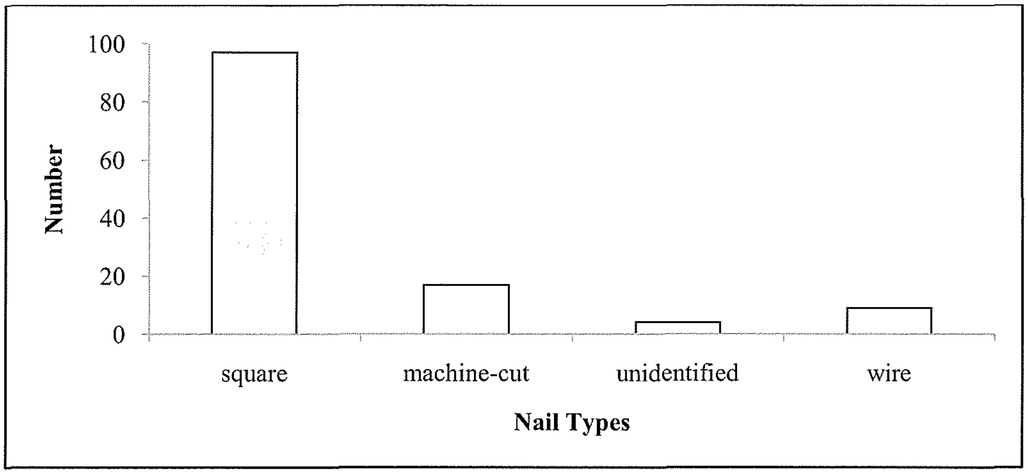

FIGURE 183. Nail types at Vancouver House Hotel. (NPS 2010)

The temporally diagnostic artifacts recovered from the 1874 Vancouver House Hotel excavation units (n=467) consist mainly of 19th-century material (97.9%, n=457) (Figure 184). The ceramic and window glass data may actually suggest an earlier construction date for the hotel. The abundance and variety of 19th-century ceramic artifacts (16.8%, n=184), and other domestic and personal items (21.9%, n=240) suggests that this was the location of a domestic structure. Historical maps and photographs show that this structure is the 1874 Vancouver House Hotel.

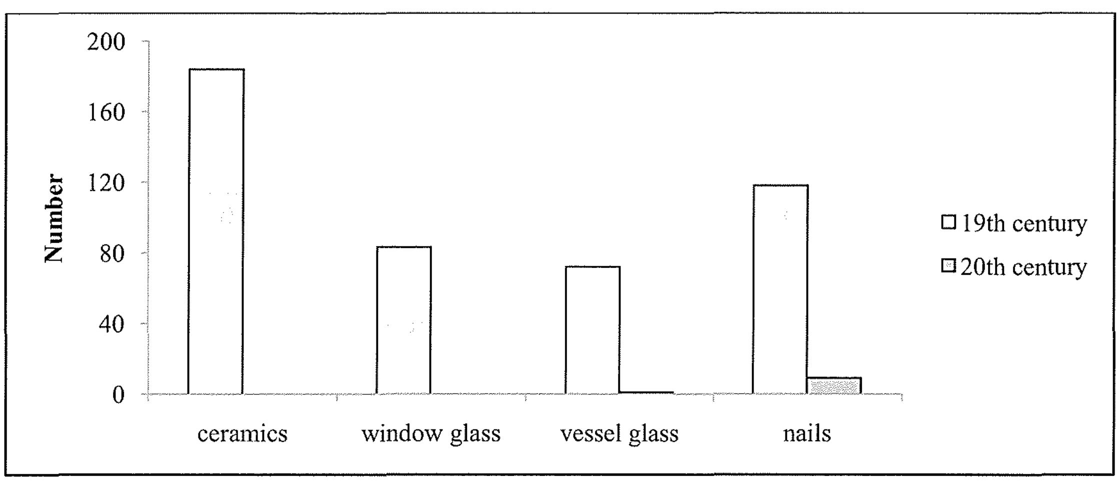

FIGURE 184. Distribution of temporally diagnostic artifacts at Vancouver House Hotel. (NPS 2010)

CONCLUSIONS AND RECOMMENDATIONS

VNHR Area #5 of the CRC APE (Old Apple Tree Park/SE Columbia Way) has been affected by numerous episodes of building, road, and railroad construction, relocation, and demolition over the past 175+ years. No intact A-horizon deposits were seen within the CRC APE in any of the Old Apple Tree Park excavation units. This area appears to have been heavily disturbed by highway and railroad construction. There is still a possibility, however, that deep shaft features may be present in this area.

VNHR Area #5 on the north side of SE Columbia Way has been the location of many filling and cutting episodes; and building, bridge, road, and railroad construction, relocation, and removal events. However, 19th- and early 20th-century cultural deposits are still present below fill layers in this area within the CRC APE. Exploratory trenching with a backhoe proved to be an efficient and economical method of investigating the stratigraphy of the area. The depth of fill deposits observed in the 21 backhoe trenches on the north side of SE Columbia Way ranged from 3 cm to greater than 200 cm, averaging 84 cm.

The results of test excavations in Area #5 of the VNHR indicate that archaeological resources that were tested that contribute to the significance of the VNHR District are present within this portion of the CRC APE on the north side of SE Columbia Way. Observations during test excavations strongly suggest that the unidentified 1859 U.S. Army Building contributes to the significance of the VNHR District under Criterion d, and 1874 Vancouver House Hotel contributes to the significance of the VNHR District under Criteria a and d. A thorough discussion of the significance of these resources is presented in Chapter 10. The 1826 Old Apple Tree contributes to the significance of the VNHR District under Criteria a and d, and is treated in more detail in the Historical Built Environment portion of this report.

Undiscovered subsurface pits, postholes, cellars, privys, activity areas, and other features related to late HBC and early U.S. Army 19th-century structures, may still exist below fill layers on the north side of SE Columbia Way within the CRC APE. The areas of the 1859 U.S. Army Building, and 1874 Vancouver House Hotel will require stripping of overburden and fill to test for buried intact deposits and deep features.

NPS archaeological testing in VNHR Area #5 has demonstrated that the CRC project as proposed will have adverse effects on cultural resources that contribute to the significance of the National-Register-listed VNHR District. Unique and irreplaceable resources on the VNHR within the CRC APE will be destroyed. Resources that may survive the direct effects of the project may lose their eligibility for the NRHP through a loss of integrity. An additional adverse effect will occur when resources are transferred out of federal ownership and lose their protection under federal cultural resources protection laws.

Adverse effects to the cultural resources detailed in this report must be resolved under 36 CFR 800.6. Adverse effects to cultural resources within the CRC APE should be avoided, if possible. If adverse effects cannot be avoided, plans to mitigate these effects should be developed through 36 CFR 800.6 or alternative processes. These efforts should be coordinated with those mitigation requirements associated with Section 4(f) of the U.S. DOT Act of 1966.

CHAPTER 10

SUMMARY OF SIGNIFICANT ARCHAEOLOGICAL RESOURCES

HISTORICAL ARCHAEOLOGICAL RESOURCES

Historical archaeological resources that were tested that contribute to the significance of the VNHR District were observed in all five NPS test areas within the CRC APE (Table 36). As noted in the "Archaeology Technical Report for the Final Environmental Impact Statement", there are a number of archaeological sites that have been recorded in or within the vicinity of the CRC APE that are associated with the VNHR National Register District: the HBC – USA Trash Dump Site (45CL47), Officers Row Historic District (45CL160H), Vancouver Barracks (45CL162H), Fort Vancouver National Historic Site (45CL163H), the Old Apple Tree (45CL164H), and Kanaka Village (45CL300H). Three of these sites contain boundaries that overlap with other resources: 45CL300 overlaps with 45CL163H, and 45CL47 is entirely contained within 45CL164H and 45CL300. Site 45CL300 was designated for much of the work conducted during the late 1970s and early 1980s associated with the Washington State Department of Transportation's relocation of the Interstate 5/SR 14 interchange and Construction Site 1 (Thomas and Hibbs 1984:1-4).

The present project's VNHR Area #1 is within the site boundary for 45CL160H, the Officers Row Historic District, while VNHR Area #2 is contained within the boundaries of the Vancouver Barracks site (45CL162H). The northern portion of VNHR Area #1 is included within the VNHR National Register District, but has never been recorded as within an archaeological site. Given the historical archaeological resources within the northern portion of the site are clearly associated with 45CL160H and 45CL162H, it is recommended that the boundaries of one of these sites should be adjusted to include these resources. Given that the Oliver Otis Howard House is located within the Vancouver Barracks site boundaries, it would probably be prudent to adjust the boundaries of these resources to include them within 45CL162H, as the Line Officer's quarters were constructed in the same line of structures as the Howard House and are roughly contemporaneous.

The southern portion of VNHR Area #2 is also not within a recorded site boundary, but was previously found by Thomas and Hibbs (1984) to contain significant deposits associated with Operation 52C (the Quartermaster's Depot blacksmith's and carpenter's shops). While this area was not identified as part of either 45CL300 or 45CL162H, this portion of VNHR Area #2 clearly relates to the operations of the U.S. Army's Quartermaster's Depot, and it is recommended that the boundaries of 45CL300 be extended to the north to include these areas. VNHR Area #3 and VNHR Area #4 are contained within the boundaries of 45CL300, as are resources described on Washington Department of Transportation property, directly west of the U.S. Army property boundary and south of the National Park Service property boundary.

The Old Apple Tree within VNHR Area #5 was also given a Smithsonian number (45CL164H) and it is recommended that those portions of the Quartermaster's Depot and the Fort Vancouver ("Kanaka") Village that were discovered and that extend west of the recorded boundaries of 45CL300 within the northern portion of VNHR Area #5 should be included within the boundaries of 45CL164H. Last, the southern portion of VNHR Area #5 is within the site boundaries for 45CL163H.

Fifteen resources contribute to the significance of the VNHR District under Criteria a-d of the National Register of Historic Places (NRHP). Three of these resources – McLoughlin Road, McLoughlin Road tree allée, and Old Apple Tree – will be addressed more thoroughly in Volume 2 of this report on the historical built environment. Maps of the location of the historical archaeological resources observed on the VNHR can be found in Figure 185 (VNHR Area #1 and VNHR Area #2) and Figure 186 (VNHR Area #3, VNHR Area #4, and VNHR Area #5).

TABLE 36
HISTORICAL ARCHAEOLOGICAL RESOURCES LOCATED DURING NPS TESTING ON THE VNHR

Area	Description	Significance Criteria*
1	1850s Old Post Cemetery	a, b, d
1 & 2	1879 Line Officers Quarters	a, d
2	1851 Blacksmith Shop	d
2	1859 Workshops	d
3	1892 U.S. Army Stable	d
3	1859 Quartermaster's Stable	d
3	1850 McLoughlin Road	a, d
3	1880s McLoughlin Road Tree Allée	a, d
3	1840s HBC Village, Kanaka House	a, c, d
3	1840s HBC Village, Tayentas House	a, b, c, d
4	1840s HBC Village, House 4	a, c, d
4	HBC Village Pond	d
5	1859 U.S. Army Building	d
5	1874 Vancouver House Hotel	a, d
5	1826 Old Apple Tree	a, d

*Criteria a-d of the NRHP contributing to the significance of the VNHR District

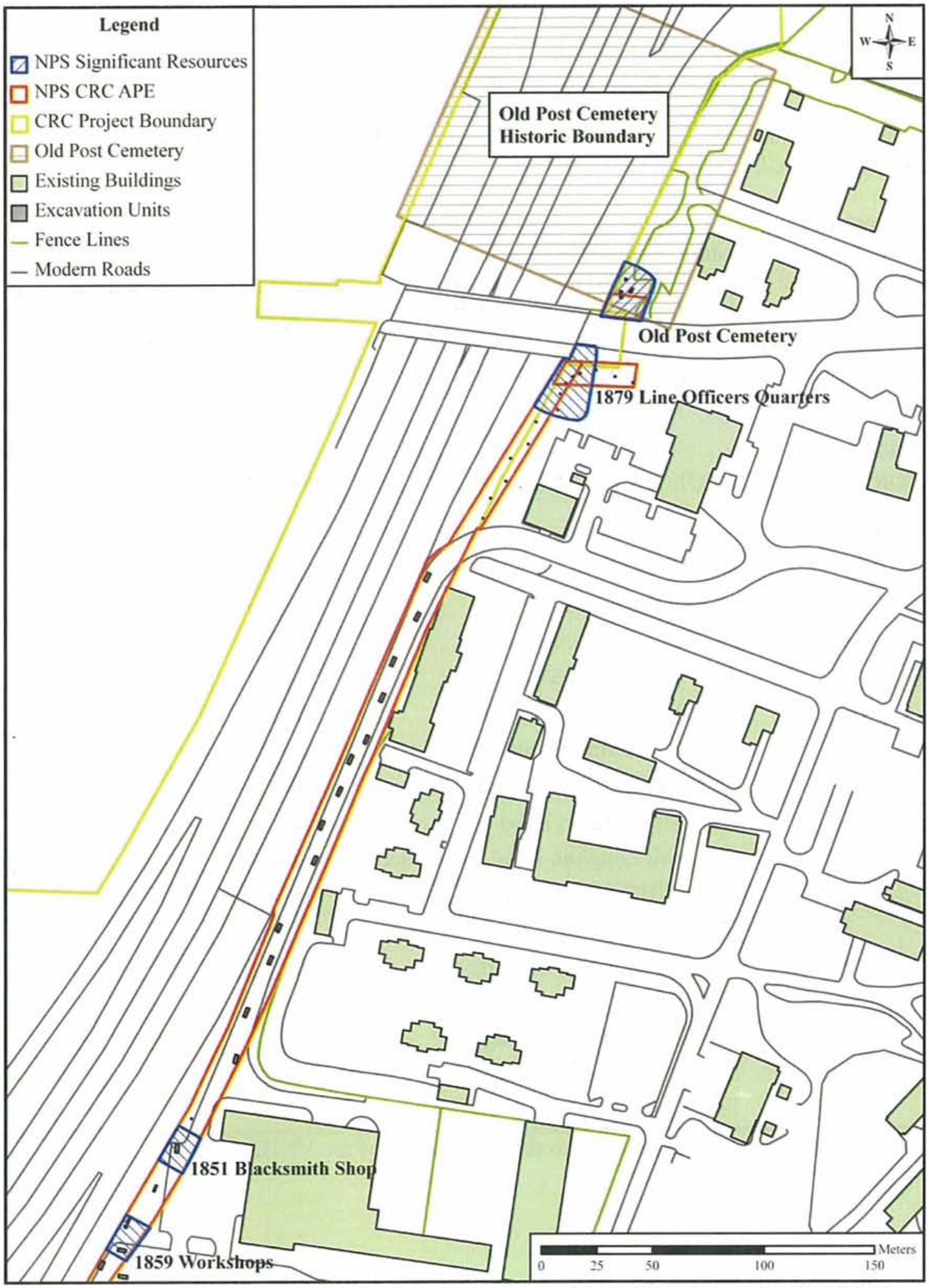

FIGURE 185. Historical archaeological resources located in VNHR Areas #1-#2 of NPS archaeological testing for the CRC project. (NPS 2010)

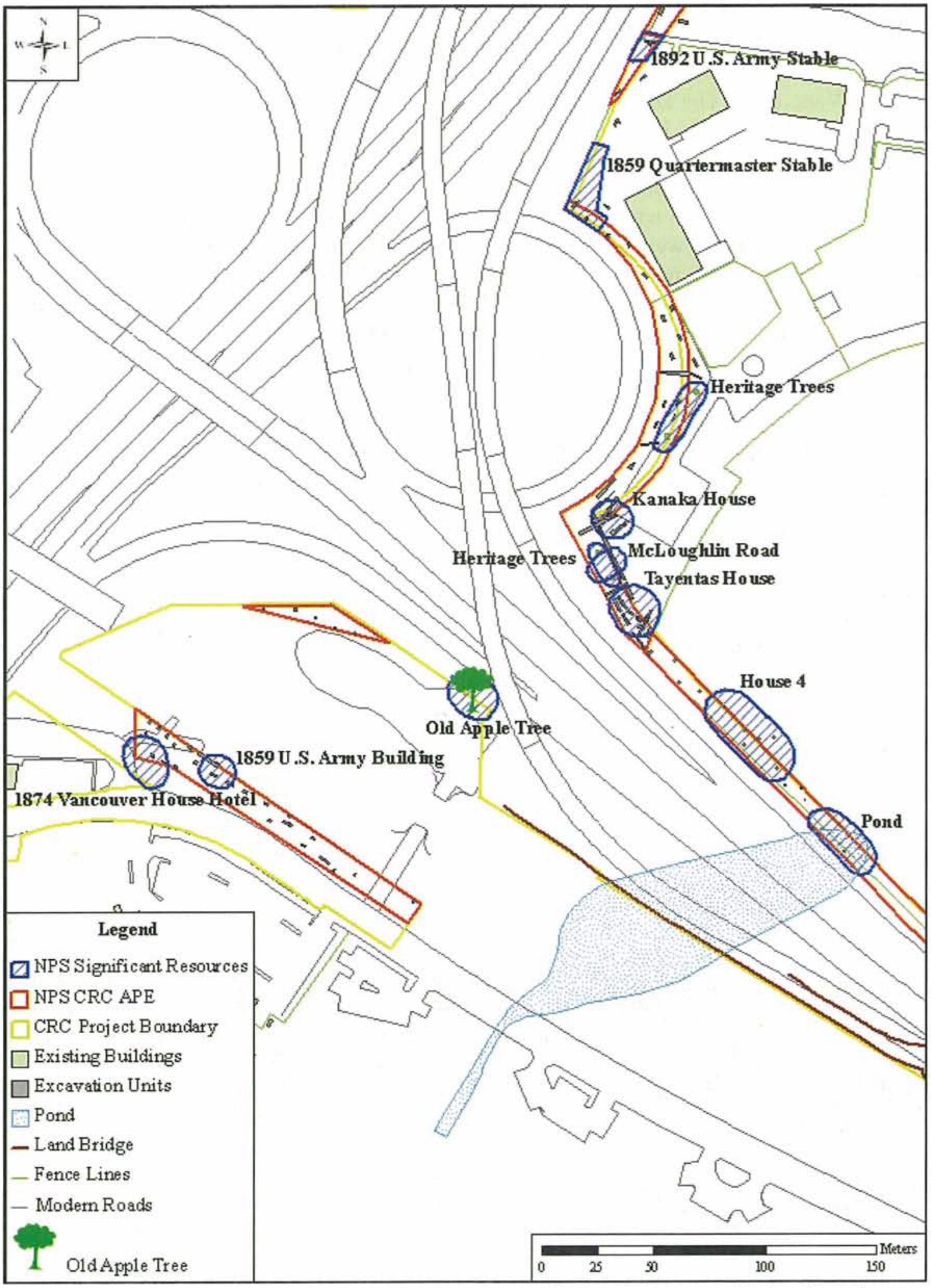

FIGURE 186. Historical archaeological resources located in VNHR Areas #3-#5 of NPS archaeological testing for the CRC project. (NPS 2010)

1850s Old Post Cemetery (VNHR Area #1)

Graves from the Hudson's Bay Company Cemetery, located on a slope northeast of St. James Mission, were relocated to the Old Post Cemetery in the early 1850s when the U.S. Army took over Fort Vancouver. The 1874 Ward map (Figure 5) shows the location of the cemetery at the west end of Officers Row. Individuals who had been buried in the HBC Cemetery included Company employees, Native Americans, and civilians, as well as U.S. military personnel. By August 1882, the total interments in the Old Post Cemetery numbered 314. The graves were presumably moved in 1883 when Officers Row was expanded (Figure 187). A presumed grave shaft and human remains were observed in this location during the excavation of two TUs. The presence of a grave shaft, human remains, and the possibility of intact burials suggest that this area is a highly sensitive cultural resource. While it is unclear how intact the cemetery is, the presence of artifacts, human remains, and features provide a tangible connection between this burial ground and the peoples who settled Fort Vancouver in the mid-19th century.

While the remaining integrity of the cemetery on the east side of the freeway has not been fully determined, it is believed that intact grave shafts, related artifacts, and human remains are present that contribute to the significance of the VNHR District under Criteria a, b, and d of the NRHP. The Old Post Cemetery is considered to be significant under Criterion a for its relationship to events associated with the HBC and early U.S. Army periods in the history of the Pacific Northwest. This resource is also important as a memorial to the early settlers and Native Americans in this region. This resource is considered significant under Criterion b as the likely second burial site of John McLoughlin II, Chinookan Chief Cassino, his family, other local Native American chiefly royalty, and notable individuals associated with the HBC and early U.S. Army.

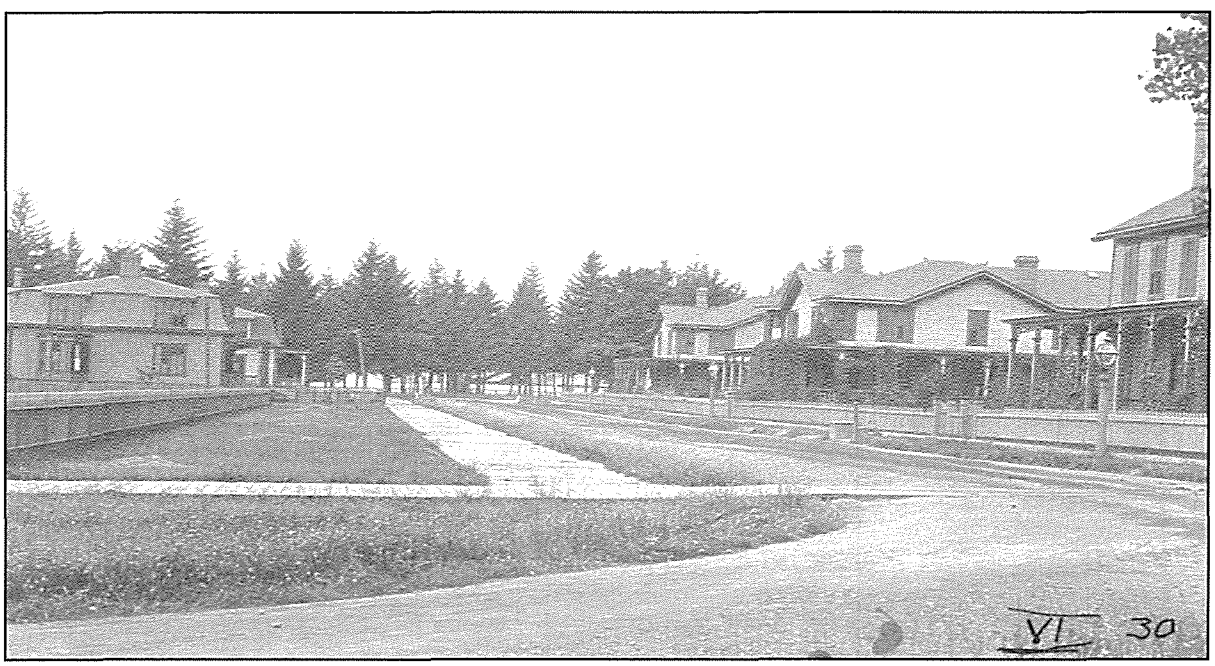

FIGURE 187. View ca. 1885, looking west down Grant Avenue toward the former location of the Old Post Cemetery (treed area), U.S. Army Military History Institute, Carlisle, PA.

This resource is considered significant under Criterion d for its potential to yield important historical information about exploration, settlement, HBC, and military activities. The cemetery could provide important information on burial customs of the U.S. military and early Vancouver settlers, including details on the early Post Cemetery burial spacing and arrangement, possibly details on the health and diet of 19th-century occupants of Vancouver, Washington (from data derived from skeletal remains), and a better understanding of Victorian burial furnishings to compare with other Northwest cemeteries. Data associated with the cemetery might provide evidence for the movement of graves from the HBC cemetery, illuminating the U.S. Army's methods and policies regarding the partial relocation of graves from that cemetery. Examination of the boundaries of the cemetery might provide evidence for how the cemetery was distinguished from other areas used by the military.

The CRC project will likely adversely affect the Old Post Cemetery through disturbance and destruction of human remains and grave features, and through the disassociation of grave goods and human remains. Because of the documented existance of unmarked graves in this cemetery, some of which are likely to be older graves transferred from the HBC cemetery, this effect is a concern under the state of Washington's RCW 27.44 "Indian Graves and Records", and RCW 68.60 "Abandoned and Historic Cemeteries and Historic Graves".

1879 Line Officers Quarters (VNHR Areas #1 and #2)

The Line Officers Quarters (Figures 188-189) was constructed during an expansion of Officers Row and first appears on Burnham's 1879 Vancouver Barracks map. The structure was referred to as Building 2&3 on the 1906 Hubbard map (Figure 27) and Building 868 on the 1936 Carsner map. This building was demolished in 1949 ahead of the construction of the Interstate 5 freeway.

Five STs were excavated within the footprint of this building during NPS testing for the CRC project. The Line Officers Quarters is significant under Criterion a of the NRHP as a contributing element of Officers Row (45CL160H), and for its association with the early U.S. Army period in the Pacific Northwest. Further archival research could provide the names of the occupants of the structure, who might prove to be important historic figures in the late 19th-century U.S. Army. The Line Officers Quarters is also significant under Criterion d for its ability to yield important information about late 19th-century military structures and activities at Vancouver Barracks. The study of this resource could lead to a better understanding of patterns in architecture of later Officers Row houses and the material culture of its occupants. This house site is transitional between the early Barracks buildings and later more formal building types. Since there have been few excavations of these types of officers quarters, important information on the use and modification of the homes is present in the archaeological deposits. The CRC project will adversely affect the Line Officers Quarters through destruction of the integrity and association of archaeological artifacts and features.

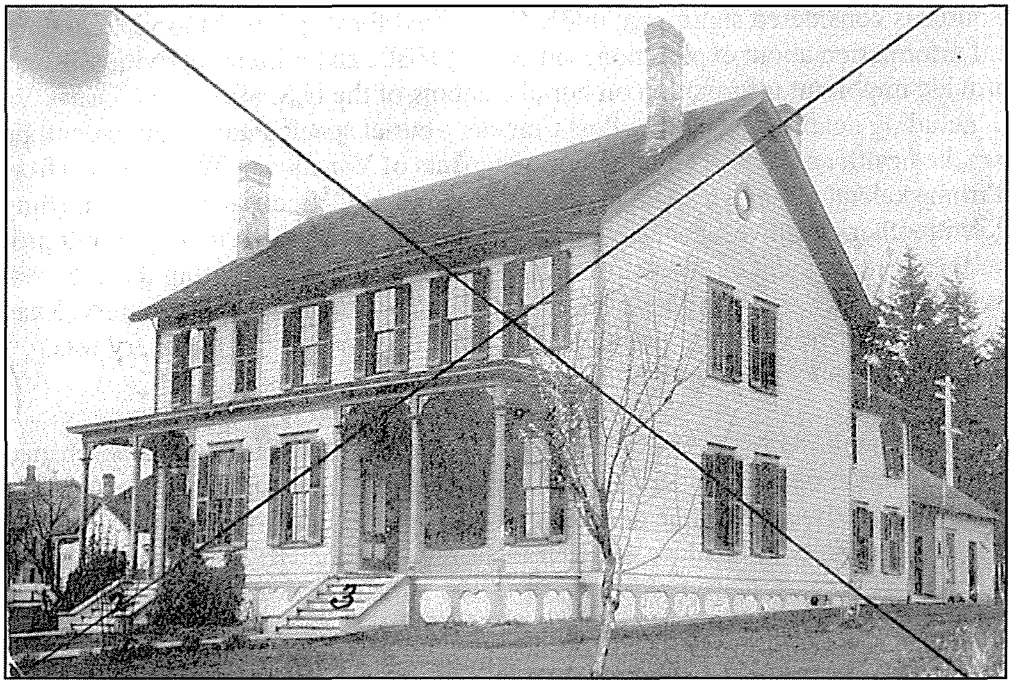

FIGURE 188. Line Officers Quarters 2&3, from the 1905 Vancouver Barracks building inventory.

FIGURE 189. World War I-era photograph of the west entrance to Vancouver Barracks, showing the Line Officers Quarters (background, right). (NPS 2010)

1851 Blacksmith Shop (VNHR Area #2)

The Blacksmith Shop was located near what is now the northwest corner of the FHWA parking lot north of East 5th Street. The Blacksmith Shop was one of the first buildings constructed in the Quartermaster's Depot at Vancouver Barracks. It first appears on the 1851 Bomford map and was present – rebuilt after a fire in the 1870s and expanded in the early 1900s – at this location into the early 1930s. The Ward map shows its 1874 location (Figure 5).

During NPS testing for the CRC project, one exploratory backhoe trench was excavated at the location of this resource, with no significant artifacts or features observed. However, Thomas and Hibbs (1984) recorded archaeological deposits associated with the Blacksmith Shop in a utility trench that cut across the footprint of the building in 1980 ahead of earlier freeway construction. They found evidence of intact multiple floor surfaces representing succesive episodes of renovation, rebuilding, and expansion, as well as several hundred pre-1860s artifacts, suggesting that it is likely that portions of this site are still present and retain their integrity.

Given the limitations of testing due to the presence of the road, the NPS considers that this area is highly likely to contain intact features from the Blacksmith Shop that would contribute to the significance of the VNHR District under Criterion d of the NRHP for its ability to yield further information about mid-to-late 19th-century U.S. Army structures, support services, and activities at Vancouver Barracks.

Data collected from these archaeological deposits could provide important information about early U.S. Army workshops, their construction, and about material used and services provided by blacksmiths of this period. The CRC project may adversely affect intact deposits associated with the Blacksmith Shop. Further exploratory work is recommended. Mechanical stripping of surface sediments should be employed within the CRC APE in this area and south to the 1859 Workshops to test for the presence of buried intact sediments, features, shafts, and pits. If these are found, then a sample of them hould be excavated, collected, and studied under an approved research plan.

1859 Workshops (VNHR Area #2)

Workshops (Figure 190), including a fire engine house, wheelwright, carpenter, saddler, and paint shops, were located adjacent to East 5th Street from the late 1850s to the early 1900s. The 1859 Harney map (Figure 191), 1874 Ward map (Figure 5), 1888 Patten map (Figure 6), and 1914 Homan map (Figure 28) show changes in the form of these buildings over time. These structures were demolished by the early 1930s to clear the ground for the FHWA buildings, seen on the 1944 Meldrum map (Figure 53).

Two exploratory backhoe trenches and one TU were excavated at the location of the Workshops, revealing discontinuous but in places intact cultural deposits associated with these buildings. Given the limitations of testing due to the extant road, it is highly likely that more intact remnants of these Workshops exist in the project area.

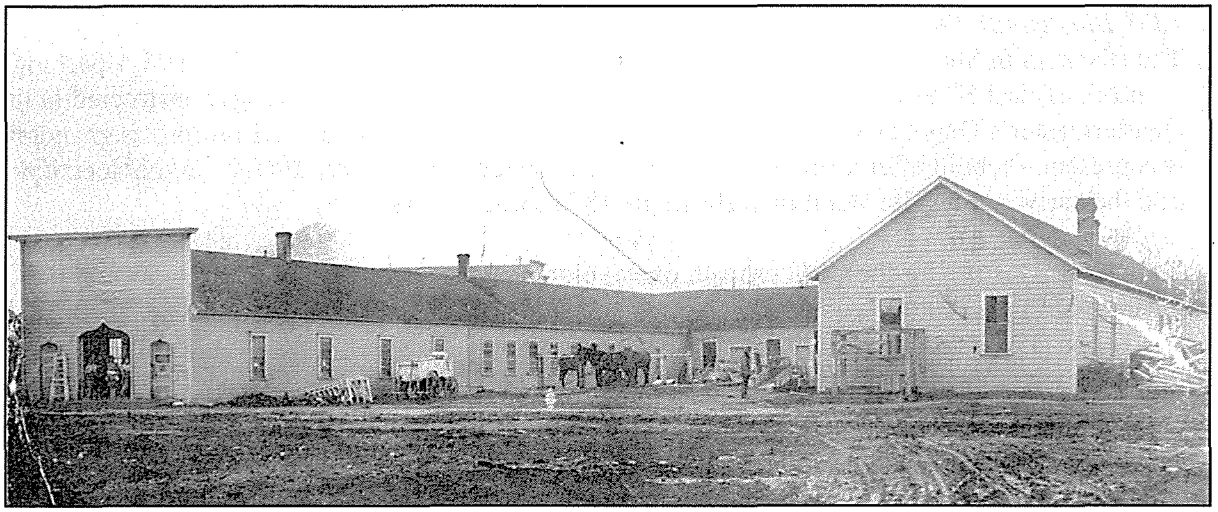

FIGURE 190. Workshops located on the north side of East 5th Street, from the 1905 Vancouver Barracks building inventory.

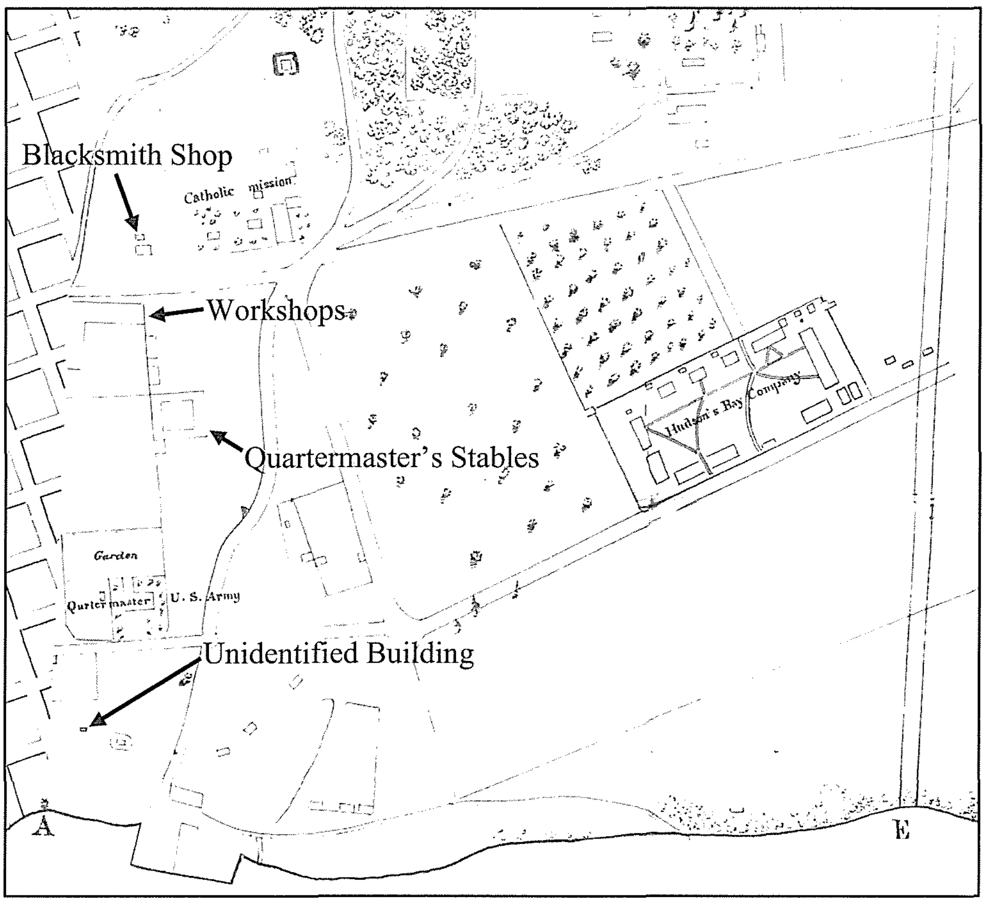

FIGURE 191. Detail of the 1859 Harney map of the military reservation at Fort Vancouver, showing the Blacksmith Shop, Workshops, Quartermaster's Stable complex, and an unidentified U.S. Army building discovered on the north side of SE Columbia Way.

It is likely that such archaeological deposits would contribute to the significance of the VNHR District under Criterion d of the NRHP for their ability to yield important information about mid-to-late 19th-century U.S. Army structures, support services, and activities at Vancouver Barracks. The study of this resource could provide information about the construction of the Workshops, and how materials and methods changed over time. Artifacts recovered from these deposits could reveal important information about the equipment and materials used by workers in these trades, and about the services they provided. As this and the Blacksmith Shop represent some of the earliest support services to the U.S. Army in the Pacific Northwest, retrieving tangible evidence of these activities would further our understanding of the extent of activities of the U.S. Army during the earliest American Colonial period in the Pacific Northwest.

If they cannot be avoided, then those areas of intact archaeological deposits associated with the Workshops may be destroyed by the CRC project, creating an adverse effect to the VNHR District. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under aspects of Section 106 of the National Historic Preservation Act (NHPA) and other federal cultural resources protection laws. Mechanical stripping of surface sediments should be employed within the CRC APE in this area and south to the 1892 U.S. Army Stable to test for the presence of buried intact sediments, features, shafts, and pits. If these are found, then a sample of them should be excavated, collected, and studied under an approved research plan.

1892 U.S. Army Stable (VNHR Area #3)

The U.S. Army Stable (Figure 192) was located just south of East 5th Street. The first Vancouver Barracks map showing this structure is the 1906 Hubbard Map (Figure 27). It was listed as a Wagon Shed and Veterinary Isolation Hospital on the 1928 Vancouver Barracks building inventory. The structure was destroyed in the 1962 Columbus Day Storm, but the concrete floor of the building continued to be used for parking at least until 1980.

An exploratory backhoe trench revealed a brick foundation up to ten courses high and three bricks wide. This feature was excavated along a three-meter portion of the trench. The archaeological remains of the U.S. Army Stable contribute to the significance of the VNHR District under Criterion d for its ability to yield important information about late 19th- and early 20th-century U.S. Army structures, support services, and activities at Vancouver Barracks. The study of this resource could provide information about the materials and methods used in the construction of the stable building, the likely renovations completed during the life of the building, and the function of the brick feature that was discovered. Artifacts recovered from these deposits could reveal important information about the services provided and materials used at an early 20th-century U.S. Army Veterinary Isolation Hospital.

The primary adverse effect to the U.S Army Stable from the CRC project is the destruction of this cultural resource. The transfer of this resource out of federal ownership would adversely affect it as it would lose protection under Section 106 of the NHPA and other federal cultural resources protection laws. Mechanical stripping of surface sediments should be employed within the CRC APE in this area and south to the Quartermaster's Stable to test for the presence of buried intact sediments, features, shafts, and pits related to the Stables.

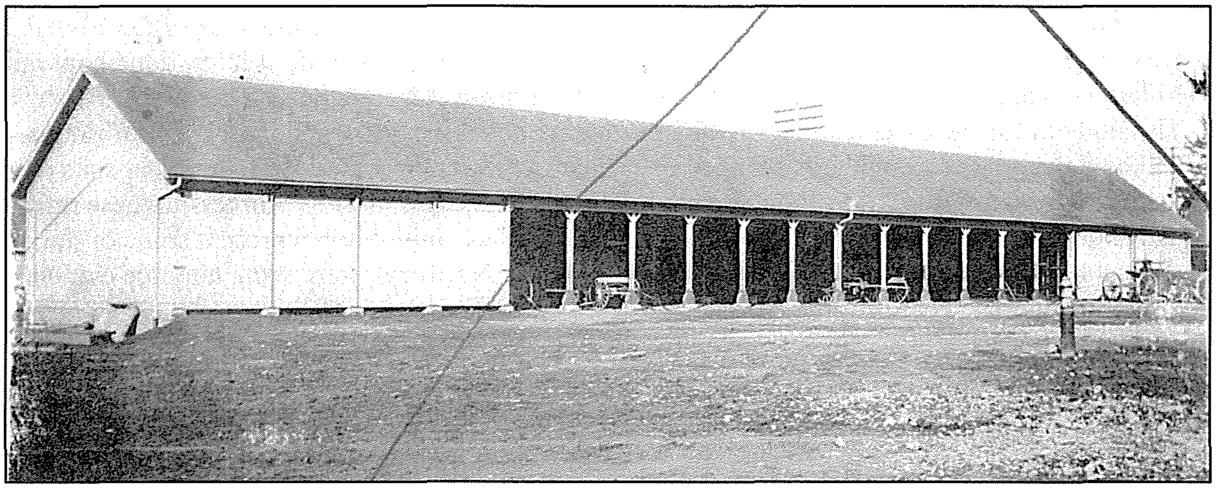

FIGURE 192. 1892 U.S. Army Stable located on the south side of East 5th Street, from the 1905 Vancouver Barracks building inventory.

ca. 1859 Quartermaster's Stable (VNHR Area #3)

The Quartermaster's Stable (Figure 193) was located south of East 5th Street behind the modern U.S. Army Building 402. The stable, one of the first buildings constructed in the Quartermaster's Depot at Vancouver Barracks, was begun in the late 1850s, underwent several episodes of renovation and expansion, and continued to be used at least into the 1910s. The evolution in the form of this building can be seen on the 1859 Harney (Figure 191), 1874 Ward (Figure 5), 1888 Patten (Figure 6), and 1914 Homan (Figure 28) maps. Thomas and Hibbs (1984) conducted archaeological excavations at the east wing of the Quartermaster's Stable in 1980 ahead of freeway construction.

During NPS testing for the CRC project, two exploratory backhoe trenches revealed artifacts and structural features associated with the Quartermaster's Stable complex. Two TUs yielded three brick foundation piers and wood structural elements associated with the west wing of the Stable building.

This cultural resource contributes to the significance of the VNHR District under Criterion d of the NRHP for its association with early U.S. Army period at the Quartermaster's Depot, and under Criterion d for its ability to yield important information about 19th-century U.S. Army structures, support services, and activities at Vancouver Barracks. The study of this resource could provide information about the materials and methods used in the construction of the stable building, the likely renovations completed during the life of this portion of the building, and could explain the differences seen in the foundation piers. Artifacts recovered from these deposits could reveal important information about the equipment and materials used at the Quartermaster's Stable complex and about the services provided there.

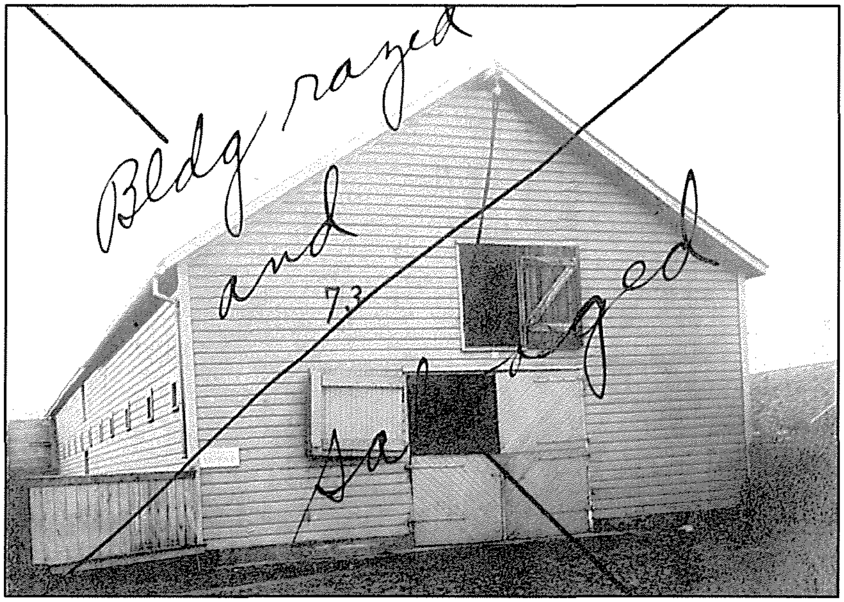

FIGURE 193. West wing of the Quartermaster's Stable from the 1905 Vancouver Barracks building inventory.

The primary adverse effect to the Quartermaster's Stable from the CRC project is the destruction of this cultural resource. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under Section 106 of the NHPA and other federal cultural resources protection laws. Further, mechanical stripping of surface sediments should be employed within the CRC APE in this area to the south end of Building 402 to test for the presence of buried intact sediments, features, shafts, and pits that may be related to this building ot to other significant areas of the U.S. Army's Quartermaster's Depot or the Fort Vancouver Village.

1850 McLoughlin Road and 1880s Tree Allée (VNHR Area #3)

McLoughlin Road (Figure 194) linked Upper Mill Road (now East 5th Street) with the Quartermaster's wharf area on the banks of the Columbia River beginning at least as early as 1850. Named for HBC Chief Factor Dr. John McLoughlin, the road was the major north/south route through Vancouver Barracks to the Quartermaster's Depot area. It is likely that the road predates the U.S. Army, and was a primary thoroughfare through the HBC Village from the waterfront to the Catholic mission site ca. 1827-1849. McLoughlin Road is first seen on the 1854 Bonneville map (Figure 12).

In the 1880s, an allée consisting of maple, oak, and walnut trees, was planted along McLoughlin Road south of East 5th Street. The alleé appeared to be largely intact through the mid-1900s, but construction projects and mortality have reduced the number of trees over the last 50 years. In the late 1970s, 14 of the heritage trees remained. Today, fewer than ten trees are still standing. One of these trees is at the south entrance to Old Apple Tree Park, and the Old Apple Tree itself lines up with the allée. Five of the heritage trees are within the CRC project area.

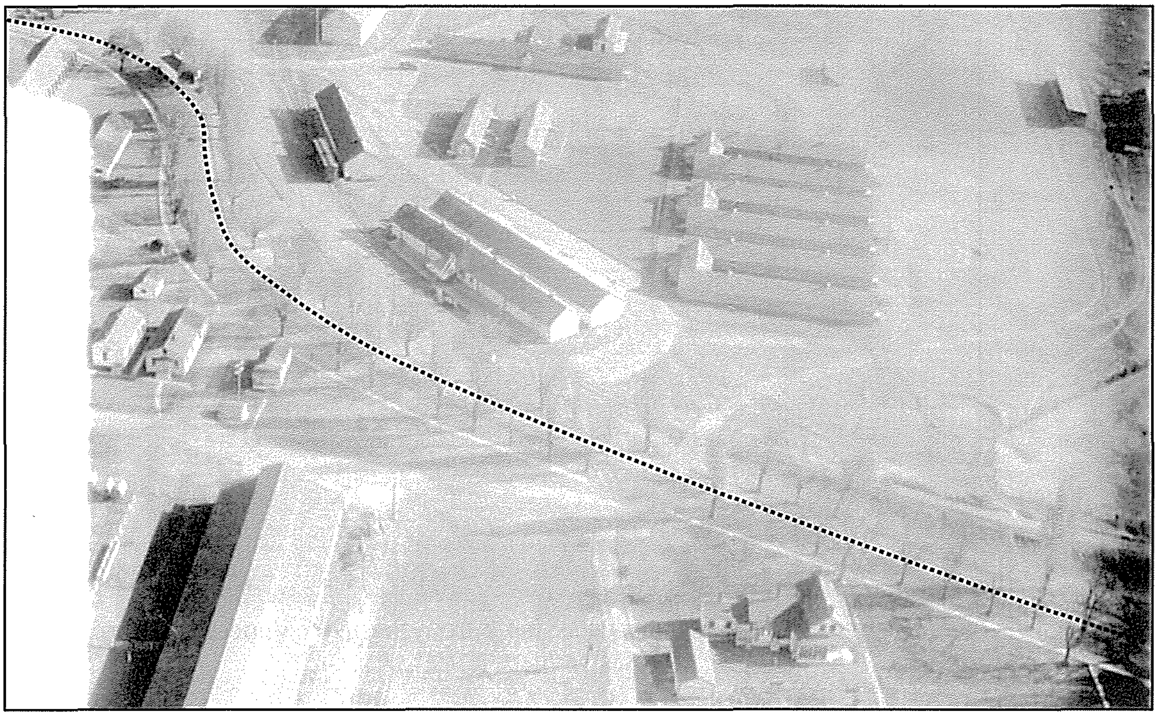

FIGURE 194. Aerial photograph of McLoughlin Road (dotted line) and the tree allée south of East 5th Street in the early 1930s. (NPS 2010)

The ca. 1826 Old Apple Tree was planted in the HBC Village along what was to become McLoughlin Road. Although a highway built along the Columbia River in the 1940s cut off access to the river from this road, McLoughlin Road continues to serve the U.S. Army buildings south of East 5th Street to this day. The road and its associated heritage trees are significant components of the cultural landscape of the VNHR. One exploratory backhoe trench and one TU revealed the intact compact macadam surface of McLoughlin Road.

This cultural resource is a continuation of McLoughlin Road north of East 5th Street, which is a contributing landscape element to the significance of VNHR District. The integrity of the alleé has declined with the removal of a number of trees, but the remaining portion of the allée within the CRC APE still conveys a sense of the original late 19th-century setting. McLoughlin Road south of East 5th Street contributes to the significance of the VNHR District under Criterion a of the NRHP for its association with the transportation routes at Fort Vancouver and their relationship to important events in the early U.S. Army period in the Pacific Northwest.

This resource is also significant under Criterion d for its association with early U.S. Army road building technology in the Pacific Northwest. The study of this resource could provide important information about 19th-century U.S. Army Quartermaster's activities, support services, commerce, communication, and construction at Vancouver Barracks. The study of the road itself could provide information about the materials and methods used, and renovations completed over time. Artifacts recovered from cultural deposits along McLoughlin Road could reveal important information about late 19th-century Quartermaster's activities at Vancouver Barracks.

McLoughlin Road overlays possible intact mid-19th-century HBC Village cultural deposits, and has the potential to provide important information about structures and activities in this area of the Village. Mechanical stripping of surface sediments should be employed within the CRC APE within areas that will be disturbed from the northernmost heritage tree south to the Village Pond to test for the presence of buried intact sediments, features, shafts, and pits related to the Fort Vancouver Village of the Vancouver Barracks Quartermaster's Depot.

The primary adverse effect to this contributing element of the VNHR District from the CRC project is the destruction of 22 meters (71 ft.) of its length, including the removal or damage of as many as five heritage trees and associated road and Village archaeological deposits. The proposed freeway alignment will encroach on the setting of the built and archaeological road remains within the Village, affecting its sense of place through the introduction of intrusive elements that would dimish its integrity and adversely affect its eligiblility for the NRHP. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under federal cultural resources protection laws, including Section 106 of the NHPA and the Archaeological Resource Protection Act (ARPA).

1840s HBC Village, Kanaka House (VNHR Area #3)

Kanaka House (Figures 195-196) is located within Kanaka Village, a contributing element of the VNHR District, off of and underneath the southwest corner of a parking lot on U.S. Army property west of the NPS HBC Village. In the late 1820s through the 1840s, the HBC Village extended throughout this entire area and south to the banks of the Columbia River. "Kanaka's" house, appearing on maps from the mid-1840s, housed Native Hawaiian laborers who worked in various capacities for the HBC.

Thomas and Hibbs (1984:312-324) conducted archaeological excavations at Kanaka House, leaving archaeological features in the ground for future study, as this resource was largely avoided during the 1980s freeway construction project. During NPS testing for the CRC project, four exploratory backhoe trenches and four TUs were excavated at the location of Kanaka House, successfully relocating the 1980s excavation units and confirming the presence of intact features and cultural material.

Kanaka House contributes to the significance of the VNHR District under Criterion a of the NRHP for its association with the early-to-mid 19th-century fur trade in the Pacific Northwest and the multiethnic HBC employee Village at Fort Vancouver. This resource may also be significant under Criterion c as an example of the now-vanished fur trade Village architecture. This resource is significant under Criterion d for its ability to yield important information about the 19th-century fur trade, Village house construction methods and materials, the lives of the HBC engagés, and specifically the lives of Native Hawaiians who worked for the HBC. Artifacts associated with this resource could provide important information to augment the scanty historical record on Hawaiian households and their use of material culture, and how the resources available to the Hawaiian laborers and the activities they conducted may have differed from other households.

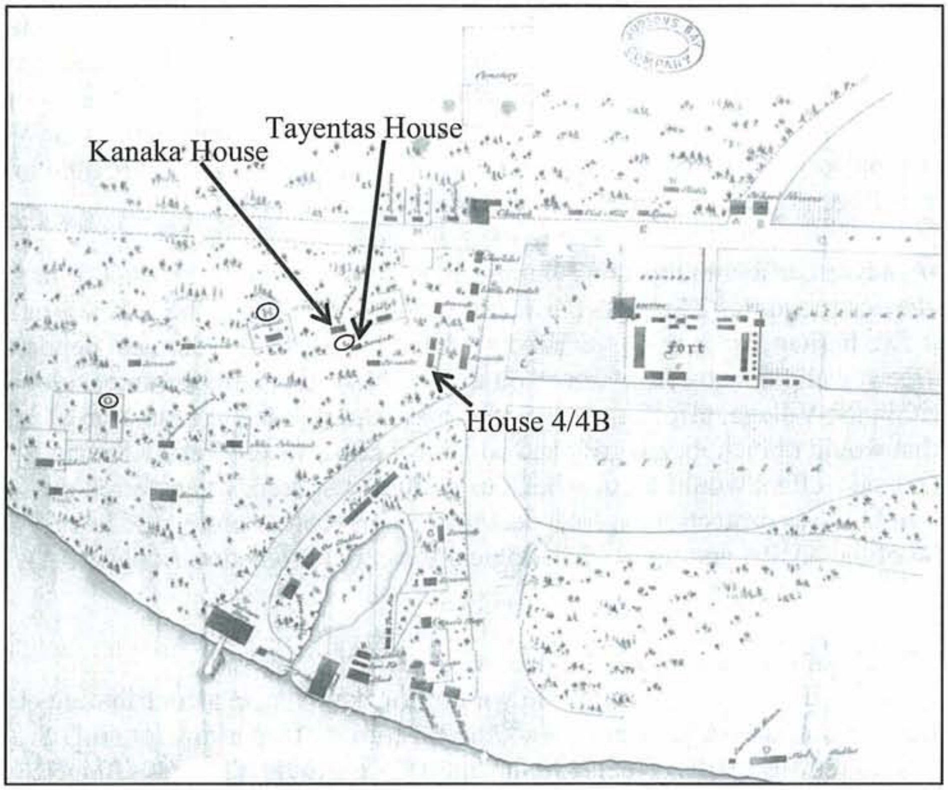

FIGURE 195. Detail of the 1846 Covington map of Fort Vancouver, showing Village houses, and letter designations keyed to HBC ledger sheets (circled). Map courtesy of the HBC Archives.

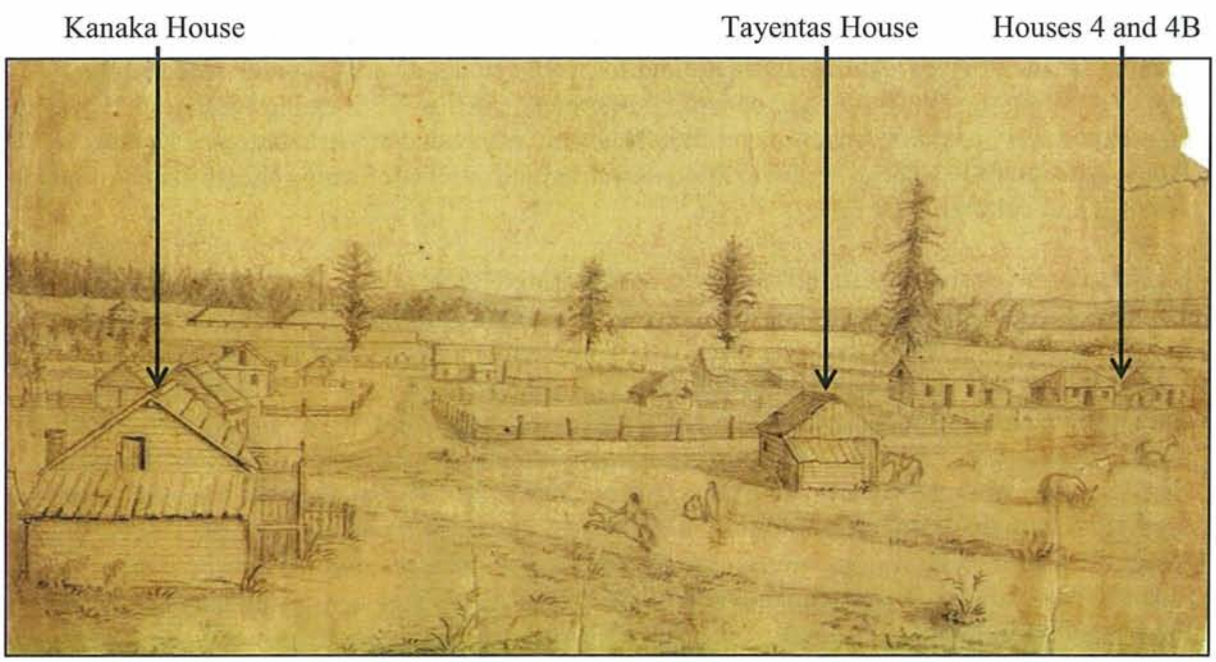

FIGURE 196. Sketch of the Village by George Gibbs, drawn from the porch of Quartermaster Ingalls' house in 1851. (Image on file at the Fort Vancouver National Historic Site Archives)

The primary adverse effect to Kanaka House from the CRC project is its potential destruction. As this is an incredibly scarce HBC Village resource, being historically tied to one of the more important ethnic groups residing in the Village, its loss is particularly acute and reduces the overall integrity of the entire Village. Even if not destroyed, the proposed freeway alignment would encroach on the resource, affecting its setting and sense of place through the introduction of dramatically different intrusive elements that would dimish its integrity. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under Section 106 of the NHPA and other federal cultural resources protection laws, especially ARPA and the Native American Graves Protection and Repatriation Act (NAGPRA).

1840s HBC Village, Tayentas House (VNHR Area #3)

Tayentas House (Figures 195-196) is located within Kanaka Village, a contributing element of the VNHR District, approximately 40 m southeast of Kanaka House, on U.S. Army property west of the NPS HBC Village. In the late 1820s through the 1850s, the HBC Village extended throughout this entire area and south to the banks of the Columbia River. This house, appearing on maps from the mid-1840s, was the residence of Joseph Tayentas, an Iroquois guide who was employed by the HBC from at least 1832-1847. Records from 1841 show that Joseph had an Indian wife and son André (Warner and Munnick 1972:63). In the 1850s, Tayentas House "L" in Figure 195) appears on HBC ledger sheets as being rented to the U.S. Army, along with house "H" (LaFramboise) and "O" (Onowanoran).

Eight exploratory backhoe trenches and nine TUs were excavated around the perimeter of Tayentas House to define its location and the scatter of associated cultural material. Tayentas House is especially important because it appears that the area around the house is entirely undisturbed, having been protected under thick layers of fill. The site contributes to the significance of the VNHR District under Criterion a of the NRHP for its association with the early-to-mid 19th-century fur trade in the Pacific Northwest and the HBC employee Village at Fort Vancouver. As a site substantively related to an Iroquois guide, this resource is significant under Criterion b. This resource may be significant under Criterion c as an example of the now-vanished fur trade Village architecture. Tayentas House is significant under Criterion d for its ability to yield important information about the 19th-century fur trade, Village house construction methods and materials, and the lives of the HBC engagés and servants. Artifacts associated with this resource could provide important information about Village households, and provide a comparison to the material culture of other Village houses. Its association with an Iroquois guide makes it one of very few HBC Village resources tied to a specific ethnic group.

The primary adverse effect to Tayentas House from the CRC project is the destruction of this cultural resource and the removal of the ever-increasingly scarce HBC Village component of the VNHR District. If not destroyed, the proposed freeway alignment would encroach on the resource, affecting its setting and sense of place through the introduction of intrusive elements that would dimish its integrity and adversely affect its eligiblility for the NRHP. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under federal cultural resources protection laws.

1840s HBC Village, House 4/4B (VNHR Area #4)

House 4/4B (Figures 195-196), a contributing element of the VNHR District, is located within Fort Vancouver National Historic Site approximately 80 m southeast of Tayentas House. In the late 1820s through the 1840s, the HBC Village extended throughout this entire area and south to the banks of the Columbia River. Two houses are shown next to each other at this same location on maps from the mid-1840s, with the caption "Servants house". Kardas (1969) identified House 4 slightly farther north, so this resource may be the southern of the two houses, referred to here as House "4B".

During NPS testing for the CRC project, six TUs were excavated around the perimeter of House 4/4B to define its location and the scatter of associated cultural material. House 4/4B contributes to the significance of the VNHR District under Criterion a of the NRHP for its association with the early-to-mid 19th-century fur trade in the Pacific Northwest and the HBC employee Village at Fort Vancouver. This resource may be significant under Criterion c as an example of the now-vanished fur trade Village architecture. House 4/4B is significant under Criterion d for its ability to yield important information about the 19th-century fur trade, Village house construction methods and materials, and the lives of the HBC engagés and servants. Artifacts associated with this resource could provide important information about a Village household, and provide a comparison to the material culture of other Village houses. The name of the resident of this house may be discovered with further archival research.

The primary adverse effect to House 4/4B from the CRC project is the destruction of this cultural resource, which by extension, will adversely affect the HBC Village component of the VNHR District. If not destroyed, the proposed freeway alignment would encroach on this resource, affecting its setting and sense of place through the introduction of intrusive elements that would dimish its integrity. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under federal cultural resources protection laws, including ARPA and NAGPRA.

HBC Village Pond (VNHR Area #4)

The HBC Village Pond (Figure 195), a contributing element of the VNHR District, was a natural feature that was connected to the Columbia River. Smaller boats ferried goods and people to and from ships on the river via the pond. The pond was used as a trash dump, by both the HBC and the U.S. Army. The Army demolished unwanted structures when it took over Fort Vancouver and used the material to fill in the pond, which last appears on the 1906 Vancouver Barracks map. It appears that the pond was finally filled in by the time the railroad was built in 1906. Deep stratified cultural deposits have been observed in previous excavation units in this area.

Two STs were excavated within the Pond during NPS testing for the CRC project. The pond contributes to the significance of the VNHR District under Criterion d of the NRHP for the information it contains on the 19th-century fur trade and early U.S. Army periods in the Pacific Northwest. Pond deposits have the ability to provide important information about the lives and material culture of the engagés and servants in the HBC Village at Fort Vancouver. These deposits can also provide important information about the demolition of structures and the disposal of material by the U.S. Army. The Pond also contains a stratified sequence of flood deposits that can address the history of Columbia River flooding over the past 200 years.

The primary adverse effect to the pond from the CRC project is the destruction 230 m^2 (2475 $ft.^2$) of this cultural resource. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses some of its protections under Section 106 of the NHPA and other federal cultural resources protection laws.

1859 U.S. Army Building (VNHR Area #5)

A small U.S. Army Building of unknown purpose is depicted on the 1859 Harney map of Vancouver Barracks (Figure 191), located between what is now the north side of SE Columbia Way and the Burlington Northern Santa Fe railroad berm. Nothing more is known about this structure, which does not appear on any other Barracks maps.

Two exploratory backhoe trenches and three TUs were excavated in the location of this building. An intact midden deposit, and a deep artifact-rich shaft or cellar feature were discovered. Mechanical stripping of surface sediments should be employed within the CRC APE throughout the west half of the SE Columbia Way area to test for the presence of buried intact sediments, features, shafts, and pits.

The 1859 U.S. Army Building contributes to the significance of the VNHR District under Criterion d of the NRHP for the information it contains on the mid-to-late 19th-century U.S. Army period in the Pacific Northwest, and for its ability to yield important information about mid-to-late 19th-century U.S. Army structures, support services, and activities at Vancouver Barracks. The study of this resource could help identify the function of this building, explain the deep feature that was associated with the building, and provide important information about the mid-to-late 19th-century U.S. Army Quartermaster's waterfront area at Vancouver Barracks.

The primary adverse effect to the 1859 U.S. Army Building from the CRC project is the potential destruction of this cultural resource. If not destroyed, the proposed realignment of SE Columbia Way would encroach on the southern portion of the Quartermaster's Depot and the HBC Village, affecting its setting and the integrity of the VNHR District. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under federal cultural resources protection laws.

1874 Vancouver House Hotel (VNHR Area #5)

The Vancouver House Hotel (Figure 197) first appears on an 1874 Ward map of Vancouver Barracks, between Main and West Reserve Streets across from the Vancouver Depot area of the Military Reserve. By 1890, the hotel had been truncated as the result of the resolution of a boundary dispute with the U.S. Army (Figure 198). The 1907 Sanborn map shows the new railroad line passing over the former location of the Vancouver House Hotel. Archaeological investigations by Gall (2003) found cultural deposits associated with this hotel.

One exploratory backhoe trench and two TUs were excavated in the location of this building during NPS testing for the CRC project. Mechanical stripping of surface sediments should be employed within the CRC APE throughout the west half of the SE Columbia Way area to test for the presence of buried intact sediments, features, shafts, and pits.

FIGURE 197. Postcard of Vancouver House Hotel at the foot of Main Street ca. 1874-1884, courtesy of the Clark County Historical Museum.

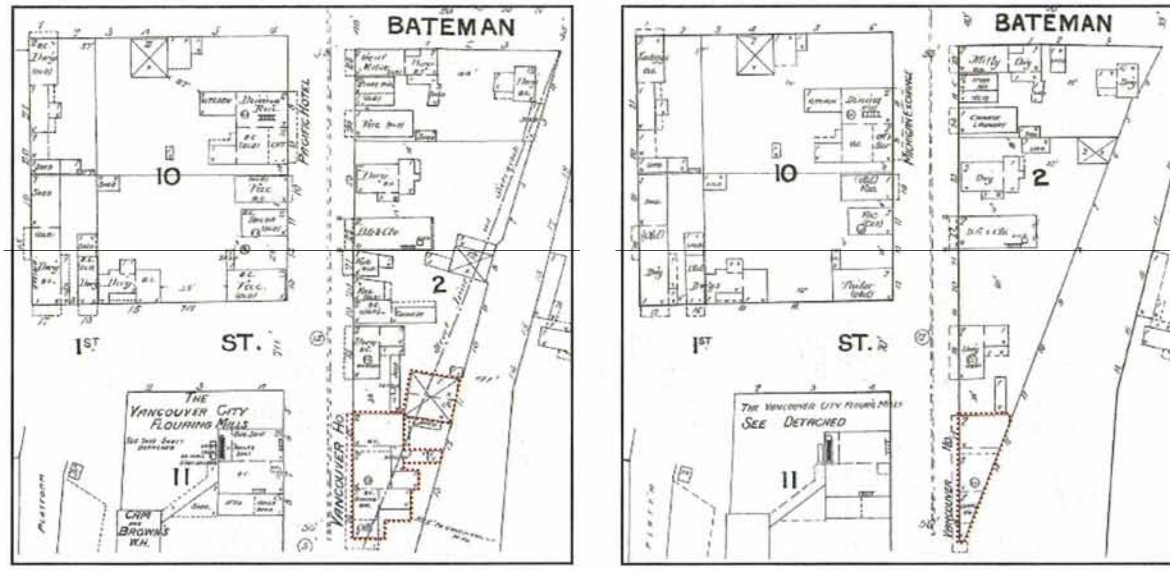

FIGURE 198. Detail of the Vancouver Sanborn Fire Insurance maps from 1888 (left) and 1890 (right) showing the effects to the Vancouver House Hotel (red) resulting from the resolution of the boundary dispute with the U.S. Army.

The Vancouver House Hotel contributes to the significance of the VNHR District under Criterion a of the NRHP for its association with the mid-to-late 19th-century U.S. Army in the Pacific Northwest, and with settlement and commerce in the early years of the City of Vancouver. Its proximity to the public docks, literally on the boundary between the U.S. Army post and the city, elevates its significance as it illustrates the tension between the U.S. Army and settlers of Vancouver. This cultural resource is significant under Criterion d for its ability to yield important information about mid-to-late 19th-century hotel buildings in Vancouver. The study of this resource could help identify different functional areas of the hotel, might provide additional information about the West Reserve Street boundary dispute and the trimming of the hotel building, and could provide important information about hotel accommodations in early Vancouver. Although many documents were destroyed in the 1890 county courthouse fire, additional archival research might reveal the identity of the early owners of the hotel – possibly important individuals in the history of the development of the City of Vancouver.

The primary adverse effect to the Vancouver House Hotel from the CRC project is the destruction of this cultural resource by the proposed realignment of SE Columbia Way. An additional adverse effect would occur when this cultural resource is transferred out of federal ownership and it loses protection under federal cultural resources protection laws.

1826 Old Apple Tree (VNHR Area #5)

The Old Apple Tree, 45CL164H (Figures 199-200), reported to be the oldest apple tree in the Pacific Northwest, was planted in 1826 or 1827. The tree is reported to have been started from seeds brought from England to Fort Vancouver by Lt. Aemilius Simpson, an officer in the Royal Navy. The Old Apple Tree was probably located in or near the yard of the John Johnson house along the road that ran from the Columbia River to Upper Mill Road (later McLoughlin Road).

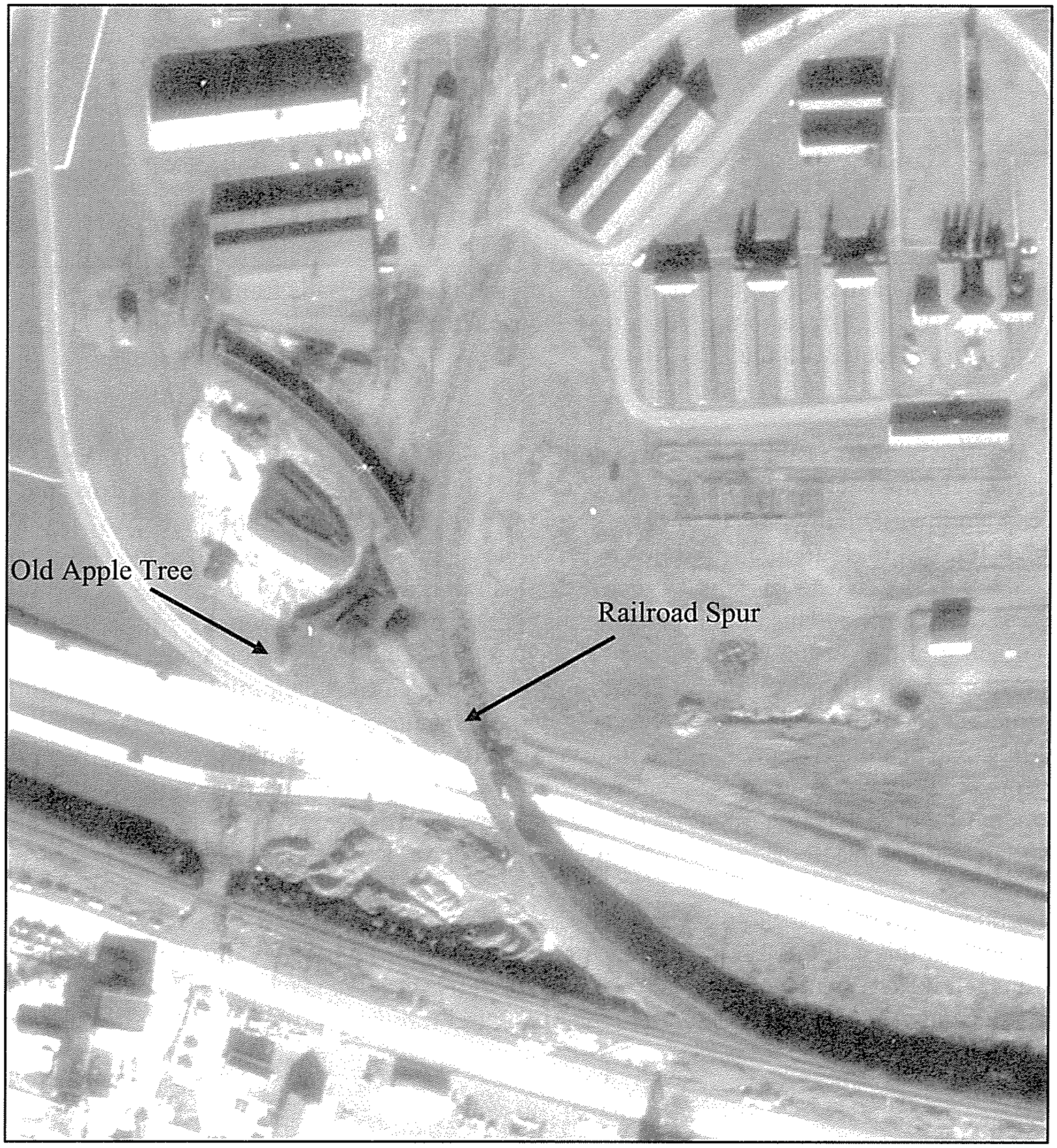

FIGURE 199. Railroad spur, trestle, and coal storage facility from a 1957 U.S. Army Corps of Engineers areial photograph.

FIGURE 200. Old Apple Tree, the oldest apple tree in the Pacific Northwest, planted ca. 1826. (FOVA 3027:DSCN0392, 4/27/04)

The Old Apple Tree is significant under Criterion a of the NRHP for its association with significant events related to the early-to-mid 19th-century HBC and early trade, agriculture, commerce, and settlement in the Pacific Northwest. It is the last living vestige of the HBC Village and is a contributing feature of the VNHR District. This resource is significant under Criterion d for its ability to yield important information about the nature of early apple horticulture as it was introduced to the Pacific Northwest.

The primary adverse effect to the Old Apple Tree from the CRC project is the alteration of the setting of the park, the visual qualities, and the feeling of place caused by the introduction of intrusive freeway roadways, ramps, overpasses, and bridges. These effects diminish the integrity of the resource and adversely affect its eligibility for the NRHP.

PREHISTORIC ARCHAEOLOGICAL RESOURCES

The lower prairie area adjacent to Fort Vancouver, called *skit-so-to-ho* by the Chinook and *ala-sikas* ("the place of mud turtles") by the Klickitat, was likely used as a temporary camp by local Indian peoples and visited seasonally for fishing and resource gathering. No known Native American villages were present in this area. Precontact archaeological resources have been typically observed as a low-level scatter throughout the VNHR, with higher concentrations of prehistoric artifacts in areas closer to the Columbia River. In this area, a more permanent fishing camp or village may have been located in the precontact period.

The results of NPS archaeological testing on the VNHR for the CRC project support this observation. Lithic tools and debitage were concentrated in VNHR Area #3, VNHR Area #4, and VNHR Area #5 closest to the Columbia River (Table 37). Twenty-six tools and 81 pieces of debitage were recovered from test units (Table 38). Ninety-two percent of tools (n=24) and 96% of debitage (n=78) was collected from units within the HBC Village or near the river on the north side of SE Columbia Way. Of these artifacts, 75% of tools and 60% of debitage were from HBC Village units (with a corresponding 25% of tools and 40% of debitage from SE Columbia Way units). This appears to suggest that stone tool manufacture was taking place in the Village, consistent with previous studies of the Village (OP14 in Thomas and Hibbs 1984). A sample of VNHR Area #4 lithic tools and projectile points is shown in Figures 201-202. A sample of VNHR Area #5 lithic tools and projectile points is shown in Figures 203-204.

The distribution of fire-cracked rock (FCR) shows a similar pattern. Ninety-four percent of FCR (n=206) was collected from units within the HBC Village or near the river on the north side of SE Columbia Way. This suggests that the majority of the stone tools and FCR within the Village contexts is associated with the contact-period village fur trade. There was no indication of a separate precontact component as has been reported for areas near the pond and farther east along SE Columbia Way (Carley 1982, Gall 2003).

In conclusion, the most significant concentrations of stone tools, lithic debitage, and FCR, usually associated with precontact Native American occupations, was directly associated with HBC Village contexts and appears to represent the traditional use of tools in the colonial fur trade settlement. No concentrations of precontact artifacts were identified within the CRC APE.

TABLE 37
PREHISTORIC ARCHAEOLOGICAL RESOURCES LOCATED DURING NPS TESTING ON THE VNHR

Area	Lithic Tools	Lithic Debitage
1	-	1
2	-	-
3	7	8
4	13	41
5	6	31

TABLE 38
LITHIC TOOLS AND DEBITAGE RECOVERED FROM THE VNHR

VNHR Area	Significant Resource Area	Unit	Level	Stratum	N	Description
VNHR #1		TU1-01	2	IIc	1	flake shatter
VNHR #3	Tayentas House	TU3-02	3	III	1	flake shatter
	Tayentas House	TU3-03	4,5,6	IIa	1	flake tool
		TU3-04	2	IIa	1	flake tool
	Tayentas House	TU3-06	2	IIa/III	1	core
	Tayentas House	TU3-06	3	III/IV	1	flake tool
	Tayentas House	TU3-06	3	III/IV	1	angular shatter
	Tayentas House	TU3-06	3	III/IV	2	flakes
	Tayentas House	TU3-08	4	III	1	angular shatter
	Kanaka House	TU3-12	5	IIa	1	flake
	Kanaka House	TU3-14	2	IIc	1	core
		TU3-17	4	IIc	1	flake
	1859 QM Stable	TU3-19	6,7	IIc	1	flake tool
	1859 QM Stable	TU3-20	5	IIc	1	flake tool
	1892 Army Stable	Trench 39	1	n/a	1	angular shatter
VNHR #4	HBC Pond	ST4-04	9	IIc	1	flake tool
	HBC Pond	ST4-04	9	IIc	1	flake shatter
	House 4/4B	TU4-01	3	IIc/III	1	flake tool
	House 4/4B	TU4-01	4	III	1	flake tool
	House 4/4B	TU4-02	2	III	1	biface tool
	House 4/4B	TU4-02	2	III	4	angular shatter
	House 4/4B	TU4-02	2	III	1	flake shatter
	House 4/4B	TU4-02	3	III	1	flake tool fragment
	House 4/4B	TU4-02	3	III	1	flake shatter
	House 4/4B	TU4-02	3	III	2	flake
	House 4/4B	TU4-02	4	III	1	flake
	House 4/4B	TU4-03	3	III	1	projectile point
	House 4/4B	TU4-03	3	III	1	flake
	House 4/4B	TU4-03	4	III	1	flake shatter
	House 4/4B	TU4-03	5	III	1	angular shatter
	House 4/4B	TU4-04	4	IIa/III	2	flake
	House 4/4B	TU4-04	5	IIa/III	7	flake
	House 4/4B	TU4-04	5	IIa/III	2	angular shatter
	House 4/4B	TU4-04	5	IIa/III	1	flake shatter

Continued on next page

TABLE 38
LITHIC TOOLS AND DEBITAGE RECOVERED FROM THE VNHR (CONT.)

VNHR Area	Significant Resource Area	Unit	Level	Stratum	N	Description
VNHR #4 (cont.)		TU4-05	2	IIc	1	flake tool
		TU4-05	2	IIc	1	angular shatter
		TU4-06	3	IIa/IV	1	angular shatter
		TU4-06	3	IIa/IV	2	flake shatter
		TU4-06	3	IIa/IV	1	flake
		TU4-06	4	III/IV	1	cobble tool
		TU4-08	1	I/IIc	1	flake tool
		TU4-08	4	IIa	1	flake shatter
		TU4-08	4	IIc	1	flake
		TU4-08	5	III	2	flake
		TU4-08	6	III	1	flake tool
	House 4/4B	TU4-10	2	IIb/III	1	flake
	House 4/4B	TU4-10	4	III	2	flake tool
	House 4/4B	TU4-10	4	III	1	projectile point
	House 4/4B	TU4-10	4	III	2	flake
	House 4/4B	TU4-10	5	III	1	angular shatter
	House 4/4B	TU4-10	6	III/IV	1	flake
	House 4/4B	TU4-11	3	IIc	2	flake
VNHR #5		TU5-02	2	IIc	1	core tool
		TU5-02	3	IIc	1	flake
		TU5-02	3	IIc	1	flake shatter
		TU5-03	3	IIc	1	flake shatter
		TU5-03	5	IIc	1	flake
		TU5-03	7	IIc	1	flake
		TU5-05	2	III	1	angular shatter
		TU5-06	2	III	1	projectile point
		TU5-06	4	IV	1	flake shatter
		TU5-07	2	IIb	1	flake
		TU5-07	2	IIb	1	flake shatter
		TU5-07	3	IIb/IV	1	flake shatter
		TU5-08	2	III	1	flake
		TU5-08	3	III/IV	1	core
		TU5-08	3	III/IV	1	flake shatter
		TU5-08	3	III/IV	1	flake

Continued on next page

TABLE 38
LITHIC TOOLS AND DEBITAGE RECOVERED FROM THE VNHR (CONT.)

VNHR Area	Significant Resource Area	Unit	Level	Stratum	N	Description
VNHR #5 (cont.)	1859 Army Building	TU5-09	3	IIa	2	flake
	1859 Army Building	TU5-09	3	IIa	1	flake shatter
	1859 Army Building	TU5-09	3	IIc	1	flake shatter
	1859 Army Building	TU5-09	6	IIa	1	biface
	1859 Army Building	TU5-09	6	IIa	5	flake
	1859 Army Building	TU5-09	6	IIa	3	flake shatter
	1859 Army Building	TU5-09	7	IIa	1	flake shatter
	1859 Army Building	TU5-09	11	IIa	2	flake
	1859 Army Building	TU5-09	11	IIa	1	flake shatter
	1859 Army Building	TU5-10	6	III	1	projectile point
	1859 Army Building	TU5-10	6	III	1	angular shatter
	1859 Army Building	TU5-11	6	IIa	1	core
	Vancouver House Hotel	TU5-12	2	IIc	1	angular shatter

FIGURE 201. Sample of lithic tools from VNHR Area #4, including projectile points and obsidian shatter. (NPS 09-17:300, 12/17/09)

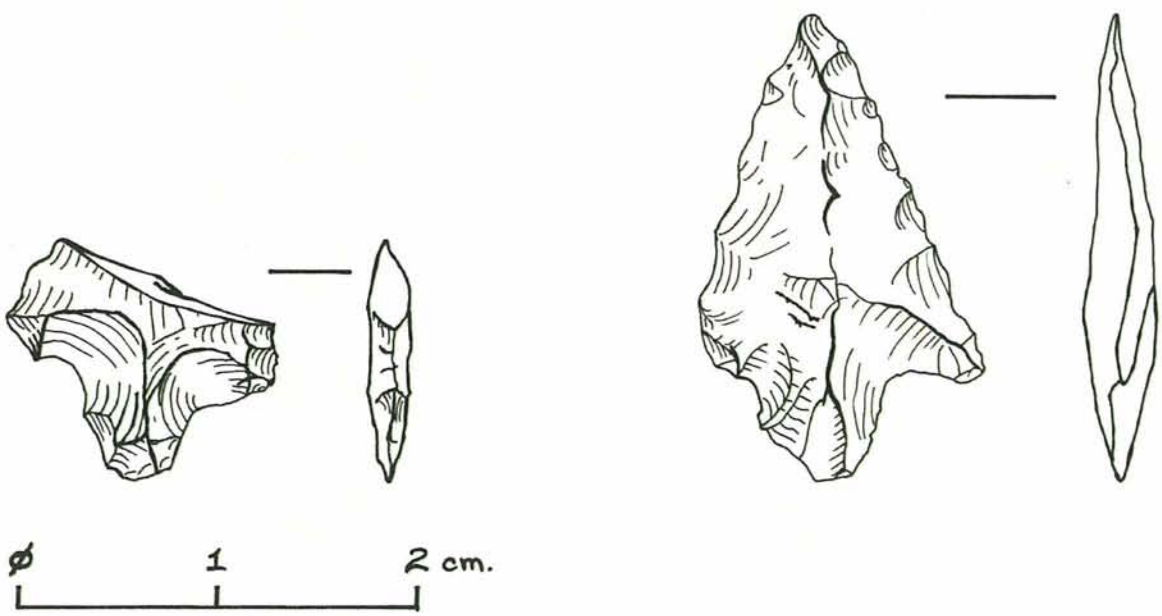

FIGURE 202. Projectile points, photographed above, from House 4/4B in VNHR Area #4. Illustrations by Jeremy Harrison.

FIGURE 203. Sample of lithic tools from VNHR Area #5, including biface (1), projectile points (2-3), and cores (4-6). (NPS 09-17:259, 12/17/09)

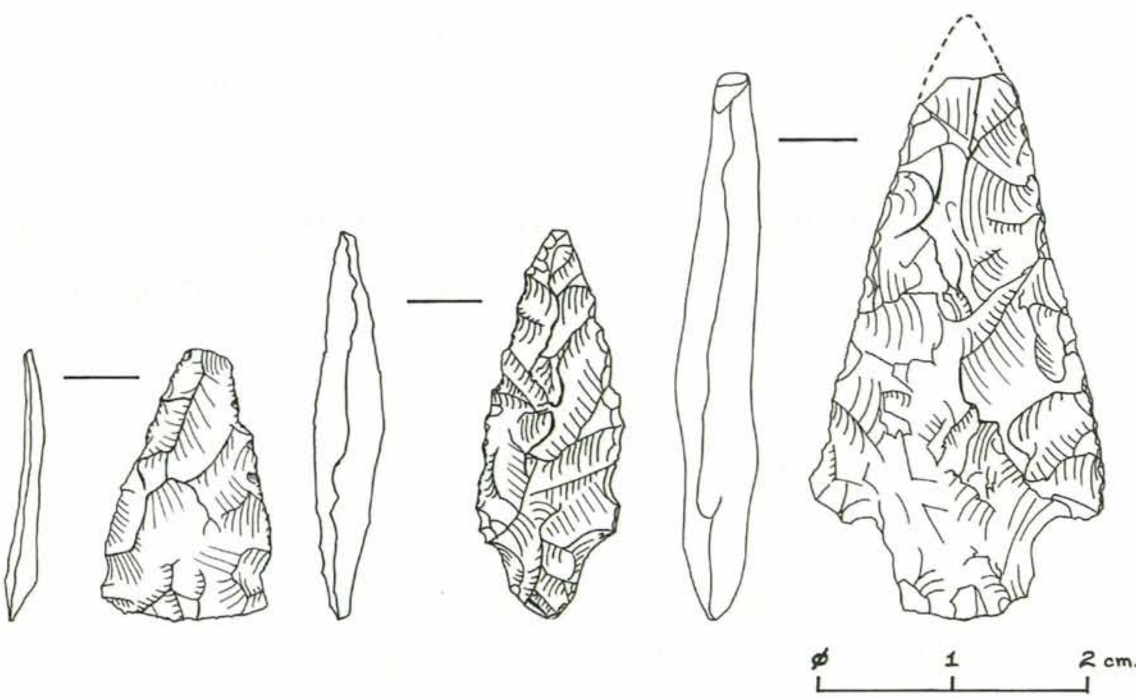

FIGURE 204. Biface (left) and projectile points (center and right), photographed above, from the 1859 U.S. Army Building in VNHR Area #5. Illustrations by Jeremy Harrison.

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Ground Penetrating Radar Investigations of Selected Areas Associated with the Columbia River Crossing Project within the Vancouver National Historic Reserve, Clark County, Washington

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Abstract

Between February 17 and March 1, 2009, ground penetrating radar investigations were conducted at selected locations with the Vancouver National Historic Reserve in Clark County, Washington. The project was requested by the Fort Vancouver National Historic Site staff for the non-invasive and non-destructive investigations of five locations within the VNHR affected by the proposed Columbia River Crossing Project. The five areas within the VNHR included the City of Vancouver properties of the Old Post Cemetery along Evergreen Boulevard and the West Barracks along Anderson Road, the U.S. Army property from East 5th Street to the west edge of the Fort Vancouver National Historic Site's Kanaka Village Site, the National Park Service property in the southern part of the Kanaka Village Site along State Route 14, and the City of Vancouver property in the Old Apple Park and National Park Service property along the north side of SE Columbia Way. The ground penetrating radar survey was conducted with a GPR cart and 400 MHz antenna. Radar profiles were collected at 0.5 m traverses. A total of 676 profile lines were collected in the five project areas for a linear distance of 15,041 meters encompassing an area of 8,085 m^2 or 2.00 acres. The GPR survey data indicated the presence of numerous anomalies associated with the fur trading era, military occupation of the area from the 19th to the 21st century, and modern urban development activities within the VNHR.

Introduction

Between February 17 and March 1, 2009, the Midwest Archeological Center (MWAC) and Fort Vancouver National Historic Site (FOVA) archeological staffs conducted a ground penetrating radar survey of five selected areas within the Vancouver National Historic Reserve (VNHR) in Clark County, Washington (Figure 1). The project was part of the FOVA archeological investigations of properties within the area of potential effect (APE) associated with the Columbia River Crossing (CRC) project (De Vore 2009a; HRA 2008; Minor and Toepel 2008; NCRI 2009). The five locations associated with the CRC project area within the VNHR included the City of Vancouver property in the Old Post Cemetery along Evergreen Boulevard west of Officers Row (VNHR Area #1), the City of Vancouver property along Anderson Road at the western edge of the West Barracks (VHNR Area #2), the U.S. Army property along Interstate 5 and State Route 14 between East 5th Street and the Fort Vancouver National Historic Site (VNHR Area # 3), the southern portion of the Kanaka Village Site within the boundary of Fort Vancouver National Historic Site (VHNR Area #4), and the City of Vancouver property in Old Apple Park and the NPS property (VNHR Area #5) between SE Columbia Way and State Route 14 (NCRI 2009:1).

The Vancouver National Historic Reserve was designated by Congress in 1996 (Public Law 104-333, sec. 502). The VNHR was established to preserve and protect the historic structures, physical assets, and cultural landscapes; to educate and interpret the significance and history of the region; and to provide public use and accessibility for the enjoyment of the VNHR (National Park Service 2000). The cultural resources within the VNHR represented a diversified cultural heritage *associated with the indigenous peoples, Euro-American exploration, trade and settlement, aviation, industrial, political, and military influence in the Pacific Northwest* (National Park Service 2000:14).

The VNHR contains the Fort Vancouver National Historic Site; the Pearson Air Field and Museum; the U.S. Army's Vancouver Barracks, Parade Ground, and Officers Row; portions of the Columbia River waterfront; and the Water Resources Education Center. The VNHR encompasses 366 acres within the City of Vancouver, Washington. Histories of the Hudson's Bay Company's Fort Vancouver, the HBC Village, and the U.S. Army's Vancouver Barracks are found in Erigero (1992), Harpers Ferry Center (2001), Hussey (1957), Jones & Jones (2005), and Thomas and Hibbs (1984). Archeological investigations at the VNHR culminated in the National Register of Historic Places (NRHP) listing of several sites as the Vancouver National Historic Reserve Historic District in 2007 (Owens et al. 2007). The district included the HBC-U.S. Army trash dump (Site 45CL54), Officers' Row (Site 45CL160H), Vancouver Barracks (Site 45CL162H), Fort Vancouver National Historic Site (Site 45CL163H), Old Apple Tree site (Site 45CL164H), Pearson Field (Site 45CL224), Kanaka Village (Site 45CL300), and the Pearson Airfield site (Site 45CL524). The district contained over 252 acres of sites and buildings that represented the human occupation of the property from the prehistoric/contact Native American period from 2500 BP to AD 1824; the Hudson's Bay Company Fort Vancouver period from 1824 to 1860; the U.S. Army's Vancouver Barracks occupation from 1849 to 1946, and the National Park Service Mission 66 period from 1954 to 1966 (NCRI 2009:8-9; Owens et al. 2007). Additional information on the archeology of the region may be found in Kirk and

Daugherty (1978), Stilson et al. (2003), and Washington State Office of Archaeology and Historic Preservation (1989).

The purpose of the ground penetrating radar project was to identify and evaluate buried archeological resources within the APE of the CRC project area (NCRI 2009:90-96). The geophysical survey technique consisted of a ground penetrating radar cart system with a 400 MHz antenna (De Vore 2009b). This technique offered an inexpensive, rapid, and relatively non-destructive and non-invasive method of identifying buried archeological resources and site patterns that were detectable and also provided means for sampling relatively large areas in an efficient manner (Roosevelt 2007:444-445; Von Der Osten-Woldenburg 2005:621-626). The previous ground penetrating radar survey of the CRC project areas utilized a 100 MHz antenna operated by Dr. Curt Peterson of Portland State University (O'Rourke 2008, personal communications). The GPR survey with the lower frequency antenna did not detect any archeological features. The lower frequency antenna had a greater depth penetration by less resolution than the higher frequency 400 MHz antenna utilized in the present GPR survey. During the geophysical investigations, FOVA archeologist Leslie O'Rourke, FOVA archeological technicians Jacqueline Cheung and Eric Gleason, FOVA student volunteer Blair Wardwell, and Z-Too Archaeological Prospection archeologist Kendal McDonald assisted in the ground penetrating radar data collection during the project.

Survey area: The Vancouver National Historic Reserve is located in the Puget Trough section of the Pacific Border province of the Pacific Mountain System division (Fenneman 1931:443-454; Taylor 1992) of the North American continent. The Puget Trough consists of diverse lowlands including a submerged part. This area is located within the transition zone between the Willamette and Puget Sound Valleys of the Northwestern Forest, Forage, and Specialty Crop Land Resource Region (USDA 2006:12-14). The region consists of gently sloping to nearly level flood plains bordered by high terraces cut by tributaries of the Willamette and Columbia Rivers (McGee 1972:1; USDA 2006:12). The VNHR lies along the right bank of the Columbia River. The area also lies within the Oregonian biotic province (Dice 1943:31-34). The native vegetation is dominated by a mixture of forest vegetation and savanna vegetation. The vegetation included Douglas fir, grand fir, big leaf maple, vine maple, salal, and ferns (McGee 1972:22). The climate is a typical West Coast temperate marine climate with generally mild summers and winters and considerable precipitation (Dice 1943:32; Phillips 1972:104-110; Trewartha and Horn 1980:273-283).

The northern portion of the Vancouver National Historic Reserve project area, including VNHR Areas #1 and 2, is located within the Lauren-Sifton-Wind River soil association of *somewhat excessively drained, dominantly nearly level to gently sloping, gravelly, medium-textured and moderately coarse textured soils of the terraces* (McGee 1972:4). The southern portion of the VNHR project area, including VNHR Areas #3, 4, and 5, is located within the Sauvie-Puyallup soil association of *deep, nearly level to gently sloping, somewhat poorly drained to somewhat excessively drained, moderately fine textured to moderately coarse textured soils of the flood plains* (McGee 1972:3). The VNHR Area #3 and Area #4 along with the lower and upper nearly level portions of Area # 2 are located within the Lauren gravelly loam soil mapping unit (LgB) with zero to eight percent slopes (McGee 1972:22-23). The nearly level to gently sloping, deep soil is found on terraces above the Columbia River (McGee 1972:23-23). The very gravelly soil formed in mixed Columbia River alluvium (McGee 1972:22). The soil may contain some volcanic ash. The soil is somewhat excessively drained soil with moderately rapid permeability. The permeability in the substratum is rapid. The available water capacity is moderate with slow surface runoff. The erosion hazard is slight. It has a moderate acid to medium acid surface layer with slightly acid to neutral subsoil (McGee 1972:22-23). The VNHR Area #1 and the middle sloping portion of Area #2 are located within the Lauren gravelly loam soil mapping unit (LgD) with 8 to 20 percent slopes (McGee 1972:22-23). The gently sloping, deep soil is found along the edges of stream terraces. The slopes are generally short in length. The moderately sloping Lauren gravelly loam exhibits many of the soil characteristics already described for the nearly level LgB mapping unit. The surface runoff is medium with a moderate erosional hazard (McGee 1972:23). The VNHR Area #5 is located within the fill land soil mapping unit (Fn), which lack any clearly defined soil characteristics (McGee 1972:13). These nearly level areas have been artificially filled with earth and/or trash, which were then smoothed over to provide a level surface (McGee 1972:13). Large areas along the Columbia River waterfront contain dredged sand and silt from the river.

Surface features: The VNHR Project Area #1 is located within the Old Post Cemetery (NCRI 2009:3). The City of Vancouver property is located on the north side of Evergreen Boulevard (Figure 2). It is bounded on the west by Interstate 5. An asphalt service driveway and parking lot separates the project area from the housing in Officers Row to the east and north. A concrete retaining wall and chain link fence lies on the west side of the property between it and the interstate highway. The majority of the rectangular project area consists of a grassy lawn with conifer trees. A small strip of bushes and flowers provide a landscaping border between the retaining wall and the grassy lawn. During the investigations of VNHR Area #1, a series of six traverses were placed across the location of known grave shafts at the northeastern corner of the parking lot on the west side of Officers Row to the northeast of the VNHR Area #1 project area (Figure 3). The area is located in the asphalt paved parking lot. The east side of the parking lot is bordered by a row of ornamental shrubs. Individual cement parking curbs or stops are located at the end of the angular parking spots.

The VNHR Project Area #2 is located in the West Barracks area on City of Vancouver property (NCRI 2009:16). The rectangular project area consists of the asphalt paved Anderson Road, which lies between Interstate 5 and the West Barracks area (Figure 4). The project area includes the section of pavement from the north end of the Barnes Hospital to the Federal Highways Administration complex at the base of the slope.

The VNHR Project Area #3 associated with the U.S. Army property consists of two areas: 1) a wedge shaped area from East 5th Street south along Interstate 5 on the back side of Army Building P402 and 2) an irregularly shaped area behind Army Building P400 along the northbound Interstate 5 ramp to the Vancouver City Center and in a secure vehicle storage area along the northbound State Route 14 ramp to Interstate 5 (NCRI 2009:32). The northern project area is further divided into the East 5th Street pavement and parking area between the Federal Highways Administration complex on the north and the U.S. Army complex on the south side of the street. The rectangular project area on East 5th Street is identified as the north section of the Area #3 survey area (Figure 5). The second portion of the northern section of the Area #3 project area lies on the west side of Army Building P400 (Maintenance/Training Shop) and is identified as the middle area (Figure 6). The rectangular project area is bounded on the north and west sides by chain link fences. Most of the middle area is open and is covered with a grassy lawn. The western portion of the project area contains brushy landscaping and a few deciduous trees. The southern portion of Area #3 is divided into the western and eastern sections. The western section lies behind the U.S. Army Building P402 (AMSA 9(G)). A chain link fence separates it from the eastern portion of the southern project area on the U.S. Army Property (Figure 7). The rectangular project area consists of Ivy ground cover and a mixture of shrubs, conifer trees, and deciduous trees with interspersed areas of grassy vegetation and barren vegetation spots. The eastern section of the southern portion of Area #3 is located in the southern secure vehicle lot on the U.S. Army Property (Figure 8). The area is enclosed by a chain link security fence separating it from the rest of the U.S. Army complex, Interstate 5 and State Route 14, and the Fort Vancouver National Historic Site. The irregularly shaped project area follows the chain link fence separating the U.S. Army property from the Interstate and State Route highway ramps. The interior edge of the project area is adjacent to the Army's asphalt parking lot and service drive. Portions of the project area are open with a vegetation cover of domestic grasses. Other portions consist of stands of conifer trees, deciduous trees, and shrubs. Ivy ground cover is also present along the chain link fences. At the southeastern end of the project area, an abandoned railroad berm follows the eastern chain link fence separating the Army property from the National Park Service FOVA unit.

The VNHR Area #4 is located in the southern part of the Kanaka Village on the Fort Vancouver National Historic Site (NCRI 2009:56). The Hudson Bay Company (HBC) village (45CL300) lies within the southwestern part of the Fort Vancouver National Historic Site (Figure 9). The open and rectangular project area lies on the north side of the State Route 14 highway. The grassy area is also bounded on the west by the Maya Lin's Confluence Project Vancouver Land Bridge.

The VNHR Area #5 is divided into two project areas with the northern portion located in the City of Vancouver's Old Apple Tree Park while the southern portion is located FOVA property on the north side of SE Columbia Way (NCRI 2009:72). The Burlington Northern Santa Fe (BNSF) railroad separated the two sections of Area #5. The northern portion of the project area in Old Apple Tree Park lies within a border planting of conifer trees and shrubs along the chain link fence separating the park from the State Route 14 highway (Figures 10 and 11). The southern unit of the project area lies on the north side of SE Columbia Way (Figure 12). It consists of two areas separated by the sidewalk from the SE Columbia Way parking lots along the Columbia River to the Land Bridge and FOVA. The area is covered with domestic grasses and weeds.

Subsurface features: The VNHR Area #1 contained a portion of the Old Post Cemetery (NCRI 2009:6-7). The cemetery was first documented on the 1855 topographic map of the Fort Vancouver military post. The bodies in the post cemetery were exhumed in 1883 and moved to the new military cemetery at the northeastern corner of the military reservation. A cultural resources survey of Officers Row resulted in the identification of ten historic feature complexes that could be adversely affected by proposed historical revitalization and adaptive reuse of the area (Thomas 1987). An archeological assessment of the proposed Officers Row development resulted in the construction monitoring of utility trenches and parking lot construction (Thomas

1988). During the course of the parking lot construction project, five oblong features were noted and identified as potential graves at the northeastern end of the Officers Row parking lot (Thomas 1988:29). A review of cemetery data by Thomas (1997:6) reported human remains were unearthed during the construction of Interstate 5 in 1953. Prior to the ground penetrating radar survey in VNHR Area #1, a magnetic gradient survey was conducted in the geophysical project area (McDonald 2009:3-4). The magnetic anomalies suggested the presence of buried archeological resources across the project area. In addition to the presence of the exhumed grave shafts, there is a potential for the presence of additional human remains in some of the exhumed and refilled grave shafts within the project area.

During the course of the military occupation of the area between 1849 and 1947, a number of buildings were constructed in and near the Army's West Barracks area, which includes the VNHR Area #2 (NCRI 2009:20-23). Research for the CRC project indicated the presence of five to six buildings and buried sewer lines in the present project area (NCRI 2009:20). Some of the buildings were razed while others were moved to different locations including a wing of the Barnes Hospital. A number of highway, utility, and revitalization projects in the West Barracks area resulted in a number of archeological investigations near the present project area (NCRI 2009:23-29). Results of the shovel test investigations on the west side of the West Barracks adjacent to Anderson Road indicated the presence of late 19th to early 20th century artifacts beneath early to mid-20th century fill (Cromwell and Gembala 2003:30; NCRI 2009:26-28). The depth of fill along north portion of Anderson Road ranged from one to three feet (0.3 to 0.9 meters). The depth of the fill along the middle section of Anderson Road ranged from two to three feet (0.6 to 0.9 meters) with fill deposits at the southern two-thirds of the section being greater than 3 feet (0.9 meters) in thickness (Cromwell and Gembala 2003:31). At the southern end of Anderson Road, the fill deposits were between two and five feet thick (0.6 to 1.5 meters). A chert dart point was found in a shovel test unit near the south end of Anderson Road (Cromwell and Gembala 2003:33). There is a potential for buried archeological resources associated with U.S. Army activities from 1849 to the present.

A number of military buildings were located within the VNHR Area #3 during the military period (NCRI 2009:34-39). The project area may also overlap portions of the Kanaka Village from the Hudson Bay Company period from 1824-1860. With the departure of the Hudson Bay Company in 1860, the U.S. Army immediately began removing buildings from the village and the fort stockade and by 1865, nearly all traces of the trading post had been removed (Thomas 1992:64). During the next several decades, numerous buildings were constructed in the vicinity of the VNHR Area #3. The buildings included Commissary and Quartermaster offices and storehouses. A Spruce Mill was constructed during World War I over the location of the Hudson Bay Company trading post (NCRI 2009:39), which resulted in the construction of several railroad spurs including the one berm noted in the southeast corner of VNHR Area #3. Following World War II, the Vancouver Barracks were reduced in size with several areas declared as surplus and many buildings were demolished or removed from Army property. During the 1970s and 1980s, a number of archeological investigations were conducted in the vicinity of VNHR Area #3 as part of the construction projects associated with the improvements to the Interstate 5 and State Route 14 interchange. The excavations indicated the presence of buried archeological resources associated with military presence during the period between 1849 and 1946 (Chance and Chance 1979, 1982; NCRI 2009:41-44). Several of the 1970s excavations were expanded in the 1980s for the proposed relocation of the Interstate 5 and State Route 14 interchange (Thomas and Hibbs 1984). Several of the areas investigated by Thomas and Hibbs (NCRI 2009:45-50) resulted in the identification of Army related structures within the VNHR Area #3, as well as a possible HBC village house. Thomas (1993) conducted archeological investigations along the edge of the VNHR Area #3 as part of the Washington State Department of Transportation's (WSDOT) proposed pedestrian undercrossing of State Route 14. The investigations included a pedestrian surface survey, a ground penetrating radar survey, and shovel test excavations. The GPR survey indicated several anomalies that were ground truthed with the shovel test excavations. The results of the investigations within VNHR Area #3 identified a location of a coal storage area and areas of Army activity during the 20th century. An extensive Army lawn irrigation system was present within the boundary of the present project area. There is a potential for buried archeological resources associated with Hudson Bay Company activities from 1824 to 1860 and U.S. Army activities from 1849 to the present.

VNHR Area #4 is located in the southern portion of the Fort Vancouver (Hudson Bay Company Village) Village or Kanaka Village. Several road were noted on the Army maps from the mid- to late 19th century crossed the project area (NCRI 2009:57-60). The northern edge of the pond from the fur trading period was located in the eastern part of the project area. A number of archeological investigations (NCRI 2009:60-68) have been conducted in the Fort Vancouver Village site (45CL300). The first recorded archeological investigations in the Village took place in 1968 (Larrabee and Kardas 1968). Although these investigations were to the north of the present project area, the results indicated a general scatter of Hudson Bay Company era artifacts. Additional investigations of the Village site in 1969 resulted in the investigations of the western portion of the project area next to the U.S. Army property (Kardas 1970). A few artifacts were found in an excavation unit in the western tractor blade scraped area that extended into the present project area. University of Washington salvage investigations in 1975 and 1975 covered the area of the HBC pond. The investigations were also conducted along the project area as part of the proposed improvements to Interstate 5 and State Route 14 interchange. The area contained a slight scatter of fur trading period artifacts (Chance and Chance 1976,1982). Additional archeological investigations in the 1980s were conducted within the Village and Vancouver Barrack as part of the proposed relocation of the Interstate 5/State Route 14 interchange (Thomas and Hibbs 1984). A portion of the archeological investigations conducted for the proposed WSDOT pedestrian undercrossing were located within the present project area (Thomas 1993). The investigations resulted in the identification of the features within the present VNHR Area #4, including pond deposits, House 4 in the village, a coal concentration from the U.S. Army coal storage area. Modifications to the WSDOT proposed pedestrian undercrossing project resulted in the continued investigations of the HBC Village and the present project area (Thomas 1994). The HBC Village site was investigations during the Portland State University and Washington State University joint archeological field school between 2001 and 2003 (Wilson 2005). Shovel tests in the vicinity of the present project area indicated the presence of HBC materials and mixed deposits of 19th and 20th century related to U.S. Army and Civilian Conservation Corps activities. There is a potential for buried archeological resources associated with Hudson Bay Company activities from 1824 to 1860, U.S. Army activities from 1849 to 1947, and National Park Service activities from 1948 to the present. In 2002, the National Park Service conducted its annual archeological prospection workshop in the village area (Bevan 2002; De Vore 2002a,2002b,2002c; Dogan 2002; Goodman 2002; Gray and Dalan

2002; Kvamme 2002; McDondal 2002; Walker 2002). Although most of the field activities were confined to the northern part of the village site, a resistance survey covered a portion of the present project area (Kvamme 2002). Prior to the ground penetrating radar survey in VNHR Area #4, a magnetic gradient survey was conducted in the geophysical project area (McDonald 2009:5-6). The magnetic anomalies suggested the presence of buried archeological resources across the project area including roads/railroad tracks, archeological materials from the HBC village occupation and the U.S. Army activities, and rebar left by NPS archeological investigations. There is a potential for buried archeological resources associated with Hudson Bay Company activities from 1824 to 1860 and U.S. Army activities from 1849 to the present (NCRI 2009:68).

VNHR Area #5 is divided into the north section in Old Apple Tree Park and the south section along SE Columbia Way (NCRI 2009:72). Prior to the GPR survey of the two sections of VNHR Area #5, a magnetic gradient survey was conducted as part of the CRC project (McDonald 2009:7-12). Both areas indicated the presence of buried archeological materials along with more recent City of Vancouver utility and construction activities. There is a potential for buried archeological resources associate with the U.S. Army in the vicinity of the two sections of the VNHR Area #5 project area.

Survey Methodology

In order to identify any buried archeological resources in the five geophysical project areas associated with the Columbia River Crossing project at the Vancouver National Historic Reserve, the National Park Service MWAC and FOVA staffs applied ground penetrating radar survey techniques to investigate and identify the nature, extent, and the location of possible archeological features associated with the 19th and 20th century fur trading activities and the military occupation of the area. The five selected geophysical survey areas consisted of eleven non-contiguous blocks of complete and/or partial 20 m by 20 m grid units. Using an Ushikata S-25 TRACON surveying compass (Ushikata 2005) and a 100-meter tape measure, the geophysical grids were positioned within each VNHR project area. During the establishment of the grid units in each of the VNHR Areas, the area was sketched and all surface or above ground features were identified on the maps. In addition to the sketch map, the grid corners of the project areas were recorded with a global positioning system (GPS) unit.

At VNHR Area #1, the project grid was originally established by Kendal McDonald (2009:3) during the magnetic survey of the project area at the Old Post Cemetery (Figure 13). The VNHR Area #1 measured 10 meters east-west by 19 meters north-south for an area of 190 m^2 (0.05 acres). The grid was oriented 10 degrees east of magnetic north. In addition to the GPR survey of VNHR Area #1, a number of profiles were collected over the area where a series of graves were identified during the construction and surfacing of the parking area on the west side of the Officers Row houses. Using photographs from the original survey, the known grave shafts were relocated. Although it was not possible to collect GPR profiles across the entire grave location due to the presence of parking curbs, a series of six profiles were collected on the west and east side of the individual curbs. Four of the six profile lines were along the same traverse with the additional two profiles located between the curbs and the ornamental shrubs and one meter west of the series of four traverses in the parking lot. Each profile line was approximately 20 m long.

The project grid at VNHR Area #2 was placed inside the east curb of Anderson Road at the west of the West Barracks area (Figure 14). The mapping station was placed at the survey nail marking the location of TP2 (dated 9/12/08). The project grid was oriented 5° 30' east of magnetic north. The east side of the grid unit was laid out with the surveying compass and 100-meter tape. The north end of the grid was located 140 meters north of the nail while the south end of the grid was located 100 meters south of the nail. The west side of the project area was six meters from the mapping station. At the south end of the project area, an additional 5 meter by 10 meter area was added to the east die of the project grid. Marking paint was used to identify the end points of the project grid on the asphalt pavement. Wooden hub stakes were placed in the vegetated area adjacent to the paved street surface and curb. The VNHR Area #2 measured 240 meter north-south by 6 meters at the north end and 11 meters at the south end for an area of 1,490 m^2 (0.37 acres).

The U.S. Army Property comprising VNHR Area #3 consisted of four non-contiguous areas divided between the northern area and the southern area. The army property was divided into two areas by chain link security fences. The main area contained the Maintenance/Training Shop (Building P402) and AMSA 9(G) (Building P400) and associated parking lot and work pad. On the south side of the main area was a secure storage area including parking for army vehicles and equipment. The two primary areas were separated by an interior security fence with a gate. Other smaller security lots between the two primary areas also contained army vehicles and equipment. The eastern portion of the southern section of VNHR Area #3 was located in the secure parking and storage lot on the south side of the U. S. Army Property in the southwestern corner of the VNHR on the north side of State Route 14 and the east side of Interstate 5 (Figure 15). This also included a portion of the main lot between AMSA 9(G) (P400) and the property boundary fence along the State Route 14 and the Interstate 5 interchanges. The western portion of the southern section of VNHR Area #3 was located behind Building P400. Near the southeast corner of the lot next to the boundary fence that separated the US Army Property from the FOLA village and VNHR Area #4, first mapping station grid point for the eastern portion of the southern section of VNHR Area #3 was established next to the southern perimeter fence. The mapping station grid point was established one meter in from the southern chain link boundary fence approximately twelve meters from the interior security fence between the army and NPS properties. Baselines were positioned along the south and east sides of the project survey area. The grid was oriented 53 degrees east of magnetic north. The grid extended 65 meters along the southern baseline next to the army's perimeter boundary fence. The project area extended 90 meters to the north. An additional 60 meters to the west of the southwestern corner of the grid to the west along the northern dogleg was gridded with wooden hub stakes placed at the corners of the partial and complete 20-meter by 20-meter grid units. The geophysical project area measured 125 meters east to west. At the northwest corner of the project area, the boundary perimeter fence curved around the Interstate 5/State Route 14 ramps. The geophysical grid units were stepped around the area with the grid unit points until the entire project area was gridded and wooden hub stakes were placed at the grid unit corners. The units were established between the boundary fence and the asphalt parking lot and drive. The project area measured approximately 245 meters east-west by 90 meters north-south for an area of 1,700 m^2 (0.42 acres). A chain link security fence separated the east and west portions of the southern section of VNHR Area #3 (Figure 16). The western portion of the section was located behind the army's service garage (AMSA 9(G), P400). Measuring off the northwestern point on the east side of the interior chain link security fence, the northern base line was extended additional 60 meters to the west. This northern baseline was located approximately one to two meters to the south of the service garage. The project area was then filled with grid points that extended to the south to the chain link boundary fence along the curve of the State Route 14 and Interstate 5 interchange ramps. Wooden hub stakes were placed at the ends of the partial and complete grid unit corners. The area measured 15 meters north-south by 55 meter east-west for an area of 825 m^2 (0.20 acres). The northern most unit in VNHR Area #3 was located in East 5th Street between the U.S. army property and the Federal Highway Administration property (Figure 17). The initial mapping station was placed at the northeast corner of the grid on the parking stripe next to the entrance to the FHWA parking lot from East 5th Street. The station was located one meter south of the sidewalk curb. The grid measured 20 meters north-south by 22 meters east-west for an area of 440 m^2 (0.11 acres). The grid was oriented eight degrees west of magnetic north. Marking paint was used to identify the grid unit corners and meter intervals on the east and west sides of the grid unit. The second grid unit on the northern section of VNHR Area #3 was located inside the U.S. Army security fence on the south side of East 5th Street (Figure 18). The project area was identified as the middle unit in VNHR Area #3. The southwest corner mapping station was established three meters east of the property fence next to the interstate. The grid was oriented 8° 30' east of magnetic north. It measured 12 meters east-west by 30 meters north-south for an area of 360 m^2 (0.09 acres). Wooden hub stakes were placed at the ends of the grid and at 20 meters north of the southern grid corner stakes. The total area surveyed in VNHR Area #3 was 3,325 m^2 (0.82 acres).

VNHR Area #4 was located in the southern portion of the Fort Vancouver Village (Site 45CL300) to the southwest of the reconstructed trading post (Figure 19). The project area was located in the open grassy area at the south side of the Hudson Bay Company (HBC) Village site. Kendal McDonald (2009) conducted a cesium gradiometer survey of the project area, which measured 100 m by 15 m next to the park boundary fence. The west side of the project area was across the boundary fence separating the park from the southern portion of the VNHR Area #3 on the US Army Property. The grid stakes from her magnetic survey were still in place at VNHR Area #4. An additional 20 m by 15m grid unit was added to the east side of the project area to access additional area within the village site next to the Land Bridge crossing State Route 14. The geophysical grid was oriented 27 degrees east of magnetic north. The VNHR Area #4 measured 120 meters east-west by 15 meters north-south for an area of 1,800 m^2 (0.44 acres).

Kendal McDonald (2009) also completed a magnetic survey of the VNHR Area #5 in the Old Apple Tree Park and along the north side of SE Columbia Way. The grid stakes placed by McDonald were used as the grid corner stakes for the GPR survey. The north unit of VNHR Area #5 was located in the Old Apple Tree Park between State Route 14 and the Burlington Northern Santa Fe (BNSF) railroad track (Figure 20). The project area was a triangular area, which McDonald divided into two overlapping rectangular areas for easier surveying and better data control. The area was divided into a 10 meter by 30 meter western unit (300 m^2 or 0.07 acres) and a 10 meter by 25 meter eastern unit (250 m^2 or 0.06 acres). The units used the same common point at the apex of the triangle where both grid met. The western grid was oriented 18 degrees west of magnetic north while the eastern grid unit was oriented 14 degrees east of magnetic north. The north unit of VNHR Area #5 was 550 m^2 or 0.14 acres. The southern unit of VNHR Area #5 was located along the north side of SE Columbia Way and on both sides of the sidewalk that goes from the parking lots along the Columbia River shoreline and the Old Apple Tree Park and the Land Bridge crossing to Fort Vancouver National Historic Site (Figure 21). The western section of the southern portion of VNHR Area #5 was also established by McDonald (2009) during her magnetic survey of selected sites within the CRC project area within the VNHR. The western portion of the grid measured 63 meters east-west by 10 meters north-south (630 m^2 or 0.16 acres). The eastern unit of the survey grid was located on the east side of the sidewalk at 87 meters east of the southwest corner. The smaller eastern grid measured 10 meters by 10 meters (100 m^2 or 0.02 acres). The total area surveyed in VNHR Area #5 was 1,280 m^2 (0.32 acres).

The geophysical survey grid corner stakes at each VNHR survey area were mapped with a Trimble GeoExplorer III global positioning system (GPS) handheld receiver (Trimble 1999). The GPS readings at stationary points (i.e., grid unit corners and individual surface features) were collected with 30 readings from five or more satellites. The field GPS data were collected in the universal transverse mercator (UTM) projection for the Zone 10 North coordinates for the North American Datum of 1983 (NAD83) horizontal datum. The data were transferred to a laptop computer via the Trimble TerraSync software (Trimble 2007a, 2007b). The data were then differentially corrected with the Trimble Pathfinder Office software (Trimble 2007c) using the USFS_BLM Portland reference station located 11 kilometers away in Portland, Oregon. Eleven files were processed with 5,413 (82.9%) of 6,528 selected positions code corrected by post-processing. The estimated range for the 5,413 corrected positions yielded 0% within an accuracy range of 0-15 cm, 0% within and accuracy range of 15-30 cm, 0% within an accuracy range of 30-50 cm, 37.4% within an accuracy range of 0.5-1.0 m, 58.2% within an accuracy range of 1.0-2.0 m, 4.0% within an accuracy range of 2.0-5.0 m, and 0.4% at an accuracy range greater than 5.0 m. The high DOP values resulted from a variety of sources including multi-pathing of the satellite signal through the overhead tree canopy, poor satellite geometry, and the number of satellites present during the collection phase. After the raw survey data in the standard storage format (SSF) was post processed, the corrected data were exported to excel data files and imported into Surfer 8 for final display (Figure 22).

Twenty-meter ropes were placed along the base lines connecting the grid unit corners. These ropes formed the traverse boundaries of each grid unit during the GPR profile data collection phase of the survey. These ropes serve as guides during the data acquisition (Figure 23). The ropes were marked with different color tape at half-meter and meter increments, which were designed to help guide the survey effort. In addition, the survey ropes at the ends of the project grid units, traffic cones were placed at the corresponding meter and half-meter marks on the baseline ropes to serve as additional guides during the data collection along each traverse or profile line. The data were acquired across the grid units beginning in the lower left hand or southwest corner of each grid unit. The first traverse was oriented towards the north at the grids in VNHR Areas #1, 2, 3 middle, 4, and 5 north. For VNHR Areas #3 north and south/east & west, and the two project area in VHNR Area #5, the data were acquired across the grid units beginning in the southwest corner of the lower right hand corner facing the grid where the profiles were collected in the east direction first.

Geophysical Survey Techniques

Geophysical prospection techniques available for archeological investigations consist of a number of techniques that record the various physical properties of the earth, typically in the upper couple of meters; however, deeper prospection can be utilized if necessary (David 1995). Geophysical techniques are divided between passive and active techniques. Passive techniques are primarily ones that measure inherently or naturally occurring local or planetary fields created by earth related processes (Heimmer and De Vore 1995:7, 2000:55; Kvamme 2001:356). The primary passive method utilized in archeology is magnetic surveying. Other passive methods with limited archeological applications include self-potential methods, gravity survey techniques, and differential thermal analysis. Active techniques transmit an electrical, electromagnetic, or acoustic signal into the ground (Heimmer and De Vore 1995:9, 2000:58-59; Kvamme 2001:355-356). The interaction of these signals with buried materials produces alternated return signals that are measured by the appropriate geophysical instruments. Changes in the transmitted signal of amplitude, frequency, wavelength, and time delay properties may also be observable. Active methods applicable to archeological investigations include electrical resistivity, electromagnetic conductivity (including ground conductivity and metal detectors), magnetic susceptibility, and ground penetrating radar. Active acoustic techniques, including seismic, sonar, and acoustic sounding, have very limited or specific archeological applications.

Ground Penetrating Radar Survey

Instrument: Geophysical Survey Systems Inc. (GSSI) TerraSIRch SIR System-3000 ground penetrating radar cart system with a 400 MHz antenna (GSSI 2003).

Specifications: SIR 3000: System hardware contains a 512 MB compact flash memory card as its internal memory. Accepts industry standard compact flash memory card up to 2 GB. Processor is a 32-bit Intel StrongArm PISC 206 MHz processor with enhanced 8.4" TFT display, 800 x 600 resolution, and 64k colors. The processor also produces linescan and O-scope displays. The GPR system uses one channel. It also uses the GSSI Model 623 survey cart with survey wheel for mounting the antenna and control unit. The 400 MHz Model 5103 ground` coupled antenna has a depth of view of approximately 4 m assuming a ground dielectric constant of 8 with a range of 50 ns, 512 samples per scan, 16 bit resolution; 5 gain points, 100 MHz vertical high pass filter, 800 MHz vertical low pass filter, 64 scans per second, and 100 KHz transmit rate.

Survey type: ground penetrating radar

Operators: Steven De Vore and field school participants

The ground-penetrating radar (GPR) survey is an active geophysical technique that uses pulses of radar energy (i.e., short electromagnetic waves) that are transmitted into the ground through the surface transmitting antenna (see Annan 2005:357-438; Bevan 1991,1998:43-57; Clark 2000:118-120,183-186; Conyers 2004,2006:131-159,2007:329-344; Conyers and Goodman 1997; Davenport 2001:89-103; David 1995:23-27; David et al. 2008:28-34; Gaffney and Gater 2003:47-51,74-76; Gaffney et al. 1991:5-6,2002:9-10; Goodman et al. 2007:375-394; Heimmer and De Vore 1995:42-47,2000:63-64; Kvamme 2001:363-365,2003:442-443;2005:436-438; Lowrie 1997:221-222; Milson 2003:167-178; Mussett and Khan 2000:227-231; Nishimura 2001:547-551; Scollar et al. 1990:575-584; Weymouth 1986:370-383; and Witten 2006:214-258 for more details on ground-penetrating radar surveys). This radar wave is reflected off buried objects, features, or interfaces between soil layers. These reflections result from contrasts in electrical and magnetic properties of the buried materials or reflectors. The contrasts are a function of the dielectric constant of the materials (Sheriff 1973:51). The depth of the object or soil interface is estimated by the time it takes the radar energy to travel from the transmitting antenna and for its reflected wave to return to the receiving antenna. The depth of penetration of the wave is determined by the frequency of the radar wave. The lower the frequency, the deeper the radar energy can penetrate the subsurface; however, the resulting resolution, or the ability to distinguish objects, features, and soil changes, decreases. The low frequency antennas generate long wavelength radar energy that can penetrate several tens of meters under certain conditions, but can only resolve larger targets or reflectors. The higher the radar wave frequency, the higher the resulting resolution but the penetration depth decreases. High frequency antennas generate much shorter wavelength energy, which may only penetrate a meter into the ground. The generated reflections from these high frequency antennas are capable of resolving objects or features with maximum dimensions of a few centimeters. A resulting tradeoff exists between subsurface resolution and depth penetration: the deeper the penetration then the resulting resolution is less or the higher the resolution then the resulting depth penetration is much shallower.

As radar antenna system (transmitting and receiving antennas) is moved along the survey line, a large number of subsurface reflections are collected along the line. The various subsurface materials affect the velocity of the radar waves as they travel through the ground (Conyers and Goodman 1997:31-40). The rate at which these waves move through the ground is affected by the changes in the physical and chemical properties of the buried materials through which they travel. The greater the contrast in electrical and magnetic properties between two materials at the interface results in a stronger reflected signal. As each radar pulse travels through the ground, changes in material composition or water saturation, the velocity of the pulse changes and a portion of the energy is reflected back to the surface where it is detected by the receiving antenna and recorded by ground-penetrating radar unit. The remaining energy continues to pass into the subsurface materials where it can be reflected by deeper reflectors until the energy finally dissipates with depth. The radar system measures the time it takes the radar pulse to travel to a buried reflector and return to the unit. If the velocity of the pulse is known, then the distance to the reflector or the depth of the reflector beneath the surface can be estimated (Conyers and Lucius 1996).

The success of the survey is dependent on soil and sediment mineralogy, clay content, ground moisture, depth of the archeological resource, and surface topography and vegetation. The ground-penetrating radar signal can be lost or attenuated (i.e., quickly dissipated) in soils that have high moisture content, high electrical conductivity, highly magnetic materials, or high clay contents. Dry soils and sediments, especially those with low clay content, represent the best conditions for energy propagation. A ground-penetrating radar survey, with its capability for estimating the depth and shape of buried objects, may be an extremely valuable tool in the search of grave shafts and trenches. At times, radar cannot profile deep enough or the strata may be so complex as to render the trenches, graves, and other types of excavations indistinguishable from the surrounding soil profile.

The TerraSIRch SIR System-3000 survey cart (Figure 24) contained a data-logger with a display that allowed the results to be viewed almost immediately after they were recorded (GSSI 2003). The SIR 3000 was set to collect GPR data with the 400 MHz antenna at an antenna transmit rate of 100 MHz and the distance mode selected for use of the survey wheel on the cart. The scan menu was set with 512 samples; 16 bit format; 80 ns range or window for VNHR Areas #1, 2, 3 north, 4, and 5; 120 ns range or window for VNHR Areas #3 middle and south/east and west; a dielectric constant of 20; a scan rate of 100; and 50 scans per meter for the project area. In the gain menu, the gain was set to manual with a default value of 5. The GPR system was moved around the grid prior to the start of the survey to adjust the gain. If a location caused the trace wave to go off the screen, the gain was set to auto and then back to manual. The position was set to the manual mode with the offset value at the factory default and the surface display option set to zero. The filters were left at the default settings. With the setup completed, the run/stop button at the bottom of the display screen was selected and the collect mode was initiated. The GPR unit was moved across the grid and at the end of the traverse, the next file button was selected and data acquisition was halted. The GPR unit was placed at the start of the next line before saving the profile. Once the profile data were saved, the GPR unit was ready to collect the next profile line. The GPR data were recorded on a 512 MB compact flash card and transferred to a laptop computer at the end of the survey.

The TerraSIRch SIR System-3000 survey cart system (GSSI 2003) operated an antenna at a nominal frequency of 400 megahertz (MHz). The antenna was mounted in a cart that recorded the location of the radar unit along the grid line. The GPR profiles were collected along 0.5 meter traverses beginning in the southwest corner of the grid unit. The data were collected in a zigzag or bidirectional fashion with the surveyor alternating the direction of travel for each traverse across the grid. At each survey grid location, the GPR file was identified with an alpha designation: VNHR Area #1 was designated FOVAD, the grave location northeast of VNHR Area #1 was designated GRAVES, VNHR Area #2 was designated FOVAE, the north unit of VNHR Area #3 was designated FOVAF, the middle unit of VNHR Area #3 was designated FOVAG, the western portion of the south unit of VNHR Area #3 was designated FOVAHA, the eastern portion of the south unit of VNHR Area #3 was designated FOVAHB, VNHR Area #4 was designated FOVAA, the south unit of VHNR Area #5 was designated FOVAB, the western portion of the north unit in VNHR Area #5 was designated FOVACA, and the eastern portion of the north unit of VNHR Area #5 was designated FOVACB. A total of 23 radar profiles were collected across the VNHR Area #1 project area for a distance of 370 meters (Figure 25). A total of 6 radar profiles were collected across the GRAVES project area for a total distance of 120 meters (Figure 26). A total of 23 radar profiles were collected across the VNHR Area #2 project area for a distance of 2,920 meters (Figure 27). A total of 41 radar profiles were collected across the north unit of the VNHR Area #3 project area for a distance of 902 meters (Figure 28). A total of 25 radar profiles were collected across the middle unit of the VNHR Area #3 project area for a distance of 520 meters (Figure 29). A total of 43 radar profiles were collected across western portion of the south unit of the VNHR Area #3 project area for a distance of 740 meters (Figure 30). A total of 188 radar profiles were collected across eastern portion of the south unit of the VNHR Area #3 project area for a distance of 3,601 meters (Figure 31). A total of 235 radar profiles were collected across the VNHR Area #4 project area for a distance of 3,330 meters (Figure 32). A total of 42 radar profiles were collected across the south unit of the VNHR Area #5 project area for a distance of 1,533 meters (Figure 33). A total of 30 radar profiles were collected across western portion of the north unit of the VNHR Area #5 project area for a distance of 609 meters (Figure 34a). A total of 25 radar profiles were collected across eastern portion of the north unit of the VNHR Area #5 project area for a distance of 516 meters (Figure 34b).

Ground penetrating radar surveys generally represent a trade-off between depth of detection and detail. Lower frequency antennas permit detection of features at greater depths but they cannot resolve objects or strata that are as small as those detectable by higher frequency antennas. Actual maximum depth of detection also depends upon the electrical properties of the soil. If one has an open excavation, one can place a steel rod in the excavation wall at a known depth and use the observed radar reflection to calibrate the radar charts. When it is not possible to place a target at a known depth, one can use values from comparable soils. Reasonable estimates of the velocity of the radar signal in the site's soil can be achieved by this method (Conyers and Lucius 1996). Using one of the hyperbolas on a radargram profile from the VNHR Area #1 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 4.8 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 24 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 1.82 meters. The signal velocity for the GRAVES project area was calculated to be 0.036 m/ns based on the hyperbola matching routine in the GPR-SLICE software. The GPR profiles extended to a depth of 1.38 meters. Using one of the hyperbolas on a radargram profile from the VNHR Area #2 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 5.6 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 28 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 2.12 meters. Using one of the hyperbolas on a radargram profile from the north unit of the VNHR Area #3 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 6.1 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 30.5 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 2.34 meters. Using one of the hyperbolas on a radargram profile from the middle unit of the VNHR Area #3 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 3.5 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 17.5 cm. With a time window of 120 ns, the GPR profiles extended to a depth of 2.04 meters. Using one of the hyperbolas on a radargram profile from the western portion of the south unit of the VNHR Area #3 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 4.8 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 24 cm. With a time window of 120 ns, the GPR profiles extended to a depth of 2.77 meters. Using one of the hyperbolas on a radargram profile from the eastern portion of the south unit of the VNHR Area #3 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 6.3 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 31.5 cm. With a time window of 120 ns, the GPR profiles extended to a depth of 3.71 meters. Using one of the hyperbolas on a radargram profile from the VNHR Area #4 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 5.9 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 29.5 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 2.27 meters. Using one of the hyperbolas on a radargram profile from the south unit of the VNHR Area #5 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 6.2 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 31 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 2.36 meters. Using one of the hyperbolas on a radargram profile from the north unit of the VNHR Area #5 project area (Goodman 2008:151-157), the velocity was calculated to be approximately 5.8 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the GPR slice would be 29 cm. With a time window of 80 ns, the GPR profiles extended to a depth of 2.21 meters.

The GPR radargram profile line data are imported into GPR-SLICE (Goodman 2008) for processing (Table 9). The first step in GPR-SLICE is to create a new survey project. This step identifies the file name and folder locations (Goodman 2008:13). The second step is to transfer the raw GPR profile data from its original location on the computer hard drive to the GRP-SLICE project folder (Goodman 2008:14). The next step is to create the information file. The number of profiles are entered, along with the file identifier name, extension identifier for GSSI radargrams, the profile naming increment of 1, the first radargram name (generally this starts with 1), direction of profiling, x and y beginning and ending coordinates, units per marker (set to 1), the time window opening in nanoseconds (60 or 120 ns), samples per scan (512 s/scn), the number of scans per meter (these profiles were collected at 50 scans per meter), and the type of data (16 bit). Selecting the create info file button completes the information file for the project (Goodman 2008:15-17). The information file can be edited if necessary to correct profile lengths (Goodman 2008:18-21). The 16-bit GSSI data are then converted to remove extraneous header information and to regain the data. During the conversion process, the signal is enhanced by applying gain to the radargrams (Goodman 2008:22-24). Once the conversion process is completed, the next step is to reverse the profile data (Goodman 2008:25-26). Since the radargrams were collected in the zigzag mode, every even line needs to be reversed. The reverse map button shows the radargrams that are going to be reversed. The next step is to insert navigation markers into the resample radargrams (Goodman 2008:27). The GSSI SIR 3000 and the artificial markers button are selected to apply markers based on the total number of scans in the radargram. The show markers button allows one to view an example of a radargram with the artificial markers in place. The next step is to create the time slices of the profile data (Conyers and Goodman 1997; Goodman 2008:28-35; Goodman et al. 1995). The program resamples the radargrams to a constant number of scans between the markers and collects the time slice information from the individual radargrams. The first step is to locate the initial ground surface reflection or 0 ns offset. The next step is to determine the number of slices (20 slices) and how thick (30 samples) to create the time slices to allow for adequate overlap between the slices. The cut parameter is set to square amplitude with the cuts per mark set to 4 (0.25 m). The profiles are then resampled and sliced. The final step in slicing the profile data is to create the XYZ time slice data files (Goodman 2008:35-36). Once the time slice data files are created, the next step is to create the grid and time slice data files (Goodman 2008:36-39). The beginning and ending values for the x and y coordinate are identified. The help set button is selected to set the x search radius, y search radius and the blanking radius. The grid cell size is set to 0.1 and the search type is rectangular. The number of grids equal 20 for the number of slices, and the starting grid number is 1. The Kriging algorithm is utilized to estimate the interpolated data. The Varigram button is selected to set the Kriging range, nugget and sill parameters. The start gridding button is selected and the gridded dataset is created. In this menu, a low pass filter may be applied to the dataset to smooth noisy data in the time slices. Two dimensional time sliced radar data area generated in the pixel map menu (Goodman 2008:40-41) for the survey grids at the five CRC project area. In addition, the original processed grid slices and the low pass filtered grid slices can be exported in the Surfer grid format. The surfer grid file is transformed into image and contour plots in Surfer. Generally, one time slice is selected for further display and analysis for each survey grid. Time slice 15 from 54 to 59 ns (Figure 35) is selected as the representative slice for further analysis of the GPR data at the VNHR Area #1 project area. Time slice 3 from 8-13 ns (Figure 36) was selected as a representative layer for display from the GRAVES project area. Time slice 4 from 12 to 17 ns (Figure 37) is selected as the representative slice for further analysis of the GPR data at the VNHR Area #2 project area. Time slice 8 from 27 to 32 ns (Figure 38) is selected as the representative slice for further analysis of the GPR data from the north unit at the VNHR Area #3 project area. Time slice 4 from 18 to 26 ns (Figure 39) is selected as the representative slice for further analysis of the GPR data from the middle unit at the VNHR Area #3 project area. Time slice 12 from 64 to 72 ns (Figure 40) is selected as the representative slice for further analysis of the GPR data from the eastern portion of the south unit at the VNHR Area #3 project area. Time slice 12 from 64 to 72 ns (Figure 41) is selected as the representative slice for further analysis of the GPR data from the western portion of the south unit at the VNHR Area #3 project area. Time slice 13 from 46 to 52 ns (Figure 42) was selected as a representative layer for display. Time slice 6 from 19 to 25 ns (Figure 43) is selected as the representative slice for further analysis of the GPR data from the south unit at the VNHR Area #5 project area. Time slice 10 from 35 to 40 ns (Figure 44) is selected as the representative slice for further analysis of the GPR data from the western portion of the north unit at the VNHR Area #5 project area. Time slice 2 from 4 to 9 ns (Figure 45) is selected as the representative slice for further analysis of the GPR data from the eastern portion of the north unit at the VNHR Area #5 project area. The gain may be readjusted for any time slice or for the entire time slice dataset (Goodman 2008:41-47). In order to create a three dimensional display of the GPR time sliced data, the existing time slices are interpolated to create normalized grids (Goodman 2008:48-49). The interpolations value is set to 5 and the new interpolated grids are all normalized. The next step is to create the 3D time slice dataset. The number of grids is now equal to 95 ((20-1)*5). The 3D data may be displayed as a series of z slices in the creation of a 3D cube with a jpeg output for animating the 3D cube (Goodman 2008:50).

Interpretations

Andrew David (1995:30) defines interpretation as a "holistic process and its outcome should represent the combined influence of several factors, being arrived at through consultation with others where necessary." Interpretation may be divided into two different types consisting of the geophysical interpretation of the data and the archaeological interpretation of the data. At a simplistic level, geophysical interpretation involves the identification of the factors causing changes in the geophysical data. Archeological interpretation takes the geophysical results and tries to apply cultural attributes or causes. In both cases, interpretation requires both experience with the operation of geophysical equipment, data processing, and archeological methodology; and knowledge of the geophysical techniques and properties, as well as known and expected archeology. Although there is variation between sites, several factors should be considered in the interpretation of the geophysical data. These may be divided between natural factors, such as geology, soil type, geomorphology, climate, surface conditions, topography, soil magnetic susceptibility, seasonality, and cultural factors including known and inferred archeology, landscape history, survey methodology, data treatment, modern interference, etc. (David 1995:30; David et al. 49). It should also be pointed out that refinements in the geophysical interpretations are dependent on the feedback from subsequent archeological investigations. The use of multiple instrument surveys provides the archeologist with very different sources of data that may provide complementary information for comparison of the nature and cause (i.e., natural or cultural) of a geophysical anomaly (Clay 2001). Each instrument responds primarily to a single physical property: magnetometry to soil magnetism, electromagnetic induction to soil conductivity, resistivity to soil resistance, and ground penetrating radar to dielectric properties of the soil to (Weymouth 1986:371).

Analysis and interpretation of the GPR data may be conducted in several different ways. The individual radargrams for each profile line may be analyzed for hyperbolic reflections. The radargrams may be combined and processed to provide planar time slices of the data. The time slices may also be combined to form 3D cubes of the GPR data. The majority of the GPR radargrams show numerous small reflections along any given profile. Most of the analysis of the GPR data is done with the 3D display while moving through the numerous time slices, but in order to provide a graphic representation of the anomalous areas, an individual time slice was selected.

Analysis of the GPR data indicated the presence of several GPR anomalies in the five project areas associated with the CRC project. At VNHR Area #1, the Old Post Cemetery, there was a series of GPR anomalies that appeared characteristic of grave shafts (Figure 46). Although the individuals were exhumed and re-buried at the national cemetery, it is possible that human remains, as well as coffin materials and other items buried with the individuals, may be encountered during the CRC project's compliance archeological investigations of the cemetery. In order to determine if the grave shafts were detectible, six traverses were made over the area where known graves were located in the parking lot to the northeast of VNHR Area #1. The GRAVES project area yielded data along the profile on the west side of the parking curbs. In order to portray the resulting GPR anomalies associated with the grave shafts, the one profile line was repeated four times. The resulting plot of the expanded profile lines indicated the presence of six grave shafts in the parking lot associated with the GRAVES project area (Figure 47). In the VNHR Area #2, numerous GPR anomalies were identified beneath the Anderson Street pavement (Figure 48). Some of these anomalous areas may be associated with buildings that once existed in the project area, as well as trash dumps and building demolition debris (NCRI 2009:20). Buried storm drains also cross the GPR project area. Several army buildings and other structures have been removed from the VNHR Area #3 (NCRI 2009:36). The northern unit of the VNHR Area #3 is located in East 5th Street between the U.S. Army property and the

Federal Highways Administration building (Figure 49). Several underground utilities are located beneath the street and parking pavement. In addition, there appear to be a couple of GPR anomalies that may be associated with buildings that have been demolished or removed from the project area. In the middle unit in the VNHR Area #3 behind the Maintenance/ Training Shop, there appears to be a buried utility line running through the survey grid (Figure 50). An area of relatively low amplitude strength radar energy may suggest the location of a structure removed from the area. A similar situation is present in the western portion of the southern unit of VNHR Area #3 next to the AMSA 9(G) building (Figure 51). It should also be noted that the lawn area behind the army buildings contains several buried irrigation lines and above ground sprinkler heads. In the eastern portion of the south unit of the VNHR Area #3, the GPR survey indicated the possibility of a well or cistern in the southeast corner of the project grid; however, the GPR anomaly could be a large piece of metal (Figure 52). The railroad berm is present in the GPR data as well as a potential location of a structure near the southwest corner of the asphalt parking lot and another one near the northeast corner of the survey grid next to the asphalt street into the secure lot. The area next to the southwest corner of the parking lot may contain the archeological remains of one of the HBC Village houses (NCRI 2009:45). VNHR Area #4 is located in the southern end of the FOVA village site. The GPR data from the geophysical investigations of the project area suggested a potential location of a structure in the western side of the survey grid (Figure 53). Linear GPR anomalies appear to represent buried utility lines but the GPR anomalies may have other natural or cultural causes. The northern unit of VNHR Area #5 is divided between the western portion and the eastern portion. The two units have a common point at the apex where they meet on the north side of the project area. In the western portion of the survey area, there is a square shaped GPR anomaly along the northern edge of the grid, which may represent the location of a structure (Figure 54). A circular GPR anomaly is located to the west of the potential structure location and my represent a well/cistern but could also be a large metal object or buried cobble in the gravelly soil. In the eastern portion of the project area, there is also a square shaped GPR anomaly, which may also represent the location of a structure (Figure 55). Linear anomalies appear to represent buried utility lines. Irrigation hoses were identified along the base of several trees within the project area. In the southern unit of VNHR Area #5, there are linear GPR anomalies that appear to be buried utility lines (Figure 56). In addition to these buried lines, there is a large rectangular are on the north side of the grid, which may indicate the location of the remains of a structure. Analysis of the GPR data from the five project areas associated with the CRC project suggests the presence of numerous GPR anomalies that could represent cultural activities. High amplitude strength radar reflections could be caused by trash dumps, building demolition debris, or natural cobbles buried in the gravelly soil.

Conclusions

During February 2009, archeologists and archeological technicians from the Midwest Archeological Center and the Fort Vancouver National Historic Site conducted ground penetrating radar investigations of five selected areas within the area of potential effect associated with the proposed Columbia River Crossing project in Clark County, Washington. The geophysical investigations consisted of a ground penetrating radar survey with a ground penetrating radar cart system and 400 MHz antenna. A total of 8,085 m^2 or 2.00 acres were surveyed during the geophysical investigations at the Vancouver National Historic Reserve. The ground penetrating radar survey of the Vancouver National Historic Reserve locations resulted in the identification of numerous subsurface anomalies associated with the fur trading period and U.S. military occupation of the property.

This report has provided a cursory review and analysis of the geophysical data collected during the geophysical investigations of the Columbia River Crossing survey areas within the Vancouver National Historic Reserve. The use of ground penetrating radar survey techniques at the Vancouver National Historic Reserve locations indicates their usefulness in collecting basic background archeological data concerning the nature and extent of the archeological resources. These techniques should be applied to all of the future archeological investigations of the Fort Vancouver National Historic Site and Vancouver National Historic Reserve.

It is extremely important to have feed-back from the archeologists concerning the nature of the identified GPR anomalies in order to refine the geophysical and archeological interpretation of the anomalies. Ground truthing should not be limited to identified anomalies but should include areas that are lacking such anomalies in order to determine what types of cultural features the may have been missed by the GPR survey. From the standpoint of the present GPR survey of the five selected areas within the CRC project, the results appear to indicate the positive contribution of the GPR data to the baseline archeological data of the nature and identification of buried cultural resources within the project area.

While the ground penetrating radar survey method provided data on the nature of the buried archeological resources, it is important to conduct additional archeological investigations to verify the interpretations (ground truthing) of the geophysical anomalies and to determine their true nature. This information will be used by the park staff to concentrate the archeological investigations of suspected subsurface features and artifacts identified in the geophysical data sets. This information may also be used by the Midwest Archeological Center and the Fort Vancouver National Historic Site staffs to guide further archeological inquiry into the nature of the original fur trading period and the subsequent military occupation, as well as modern National Park Service and U.S. Army activities.

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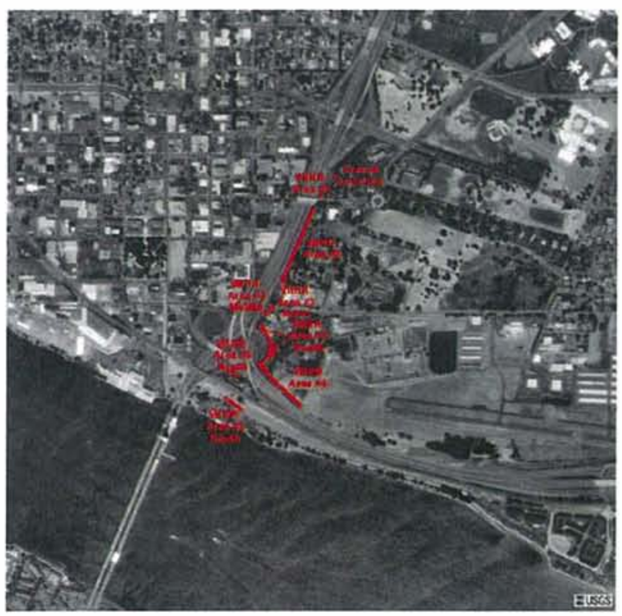
Figures

a) USGS 7.5 minute topographic map (Vancouver, Washington, United States, dated 01 July 1995)



b) USGS aerial photograph (Vancouver, Washington, United States, dated 08 May 2002)

Figure 1. Location of geophysical project areas within the Vancouver National Historic Reserve, Vancouver, Washington.

Figure 2. General view of the Old Post Cemetery area in VNHR Area #1 (view to the southwest).

Figure 3. General view of the graves location in the Officers Row parking lot (view to the northeast).

Figure 4. General view of the VNHR Area #2 from base of hill (view to the north northeast).

Figure 5. General view of the north unit in VNHR Area #3 (view to the west).

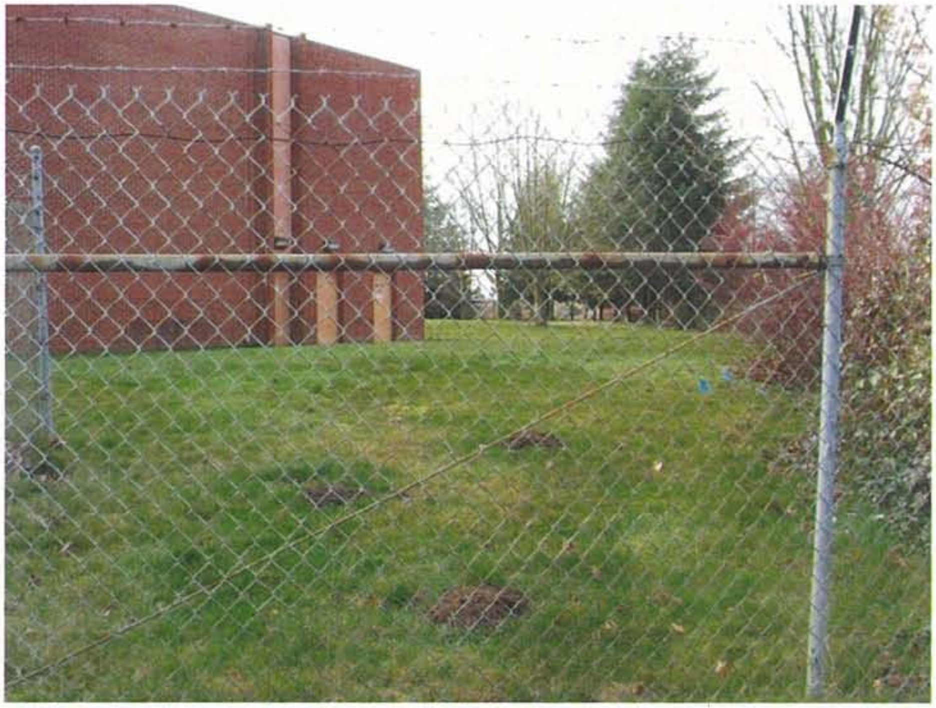


Figure 6. General view of the middle unit in VNHR Area #3 from the security fence next to East 5th Street (view to the southwest).

Figure 7. General view of the western portion of the south unit in VNHR Area #3 form the west side (view to the northwest).

a) general view of the north side of the eastern portion of the south unit of VNHR Area #3 (view to the southwest)

b) general view of the south side of the eastern portion of the south unit of VNHR Area #3 (view to the northeast)

Figure 8. General views of the eastern portion of the south unit in VNHR Area #3.

Figure 9. General view of the VNHR Area #4 in the south side of the HBC Village (view to the southeast).

Figure 10. General view of the eastern portion of the north unit in VNHR Area #5 (view to the northwest).

Figure 11. General view of the western portion of the north unit in VNHR Area #5 (view to the east).

Figure 12. General view of the south unit of VHNR #5 (view to the west northwest).

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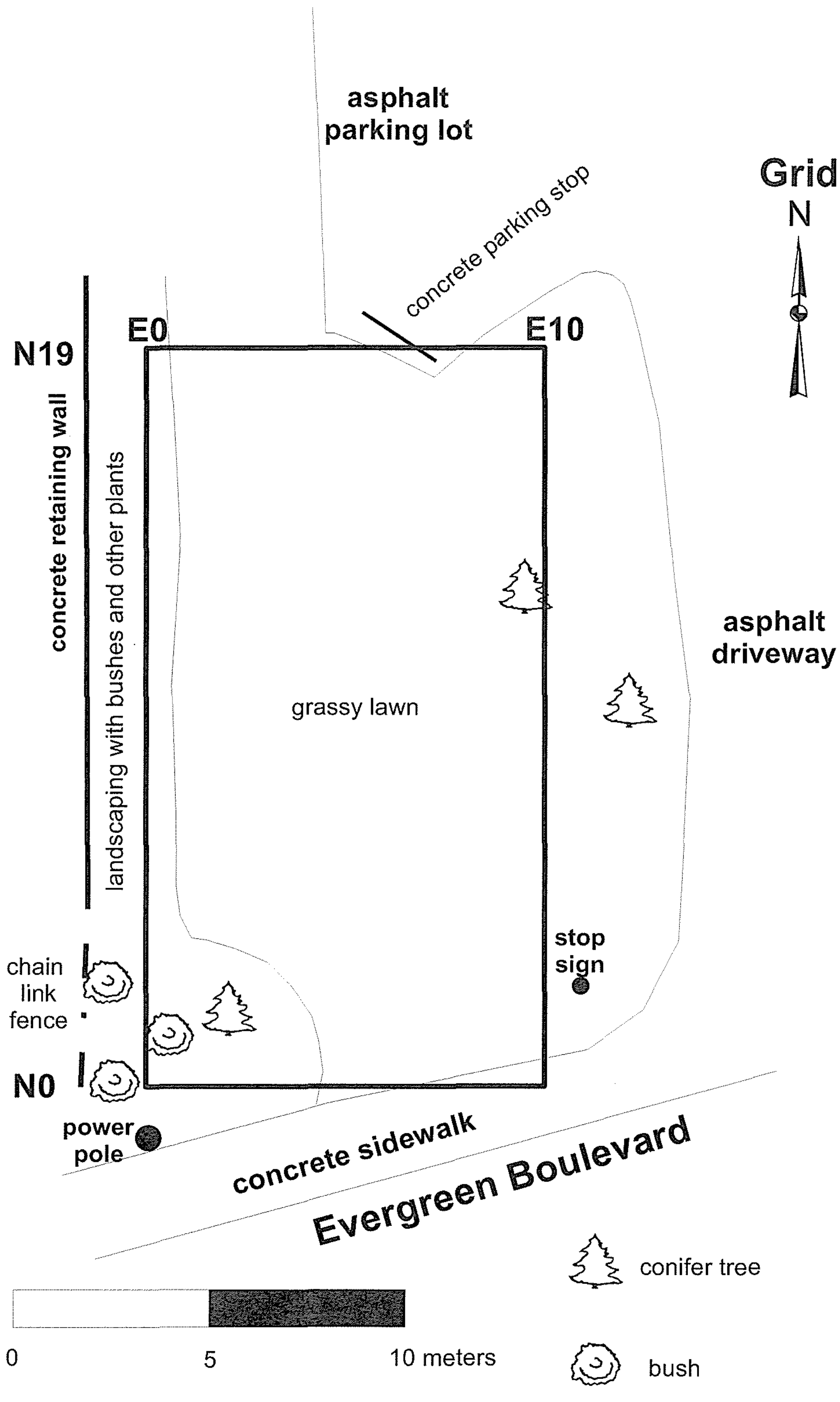


Figure 13. Sketch map of the VNHR Area #1.

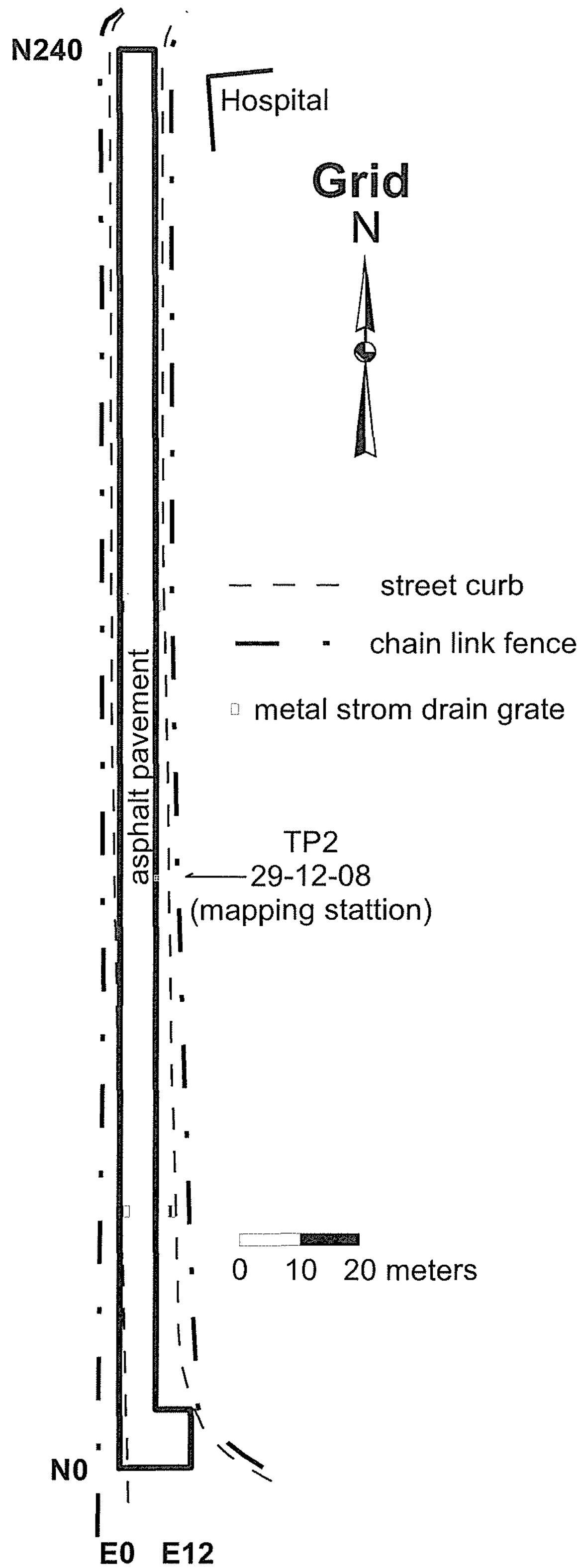


Figure 14. Sketch map of the VNHR Area #2.

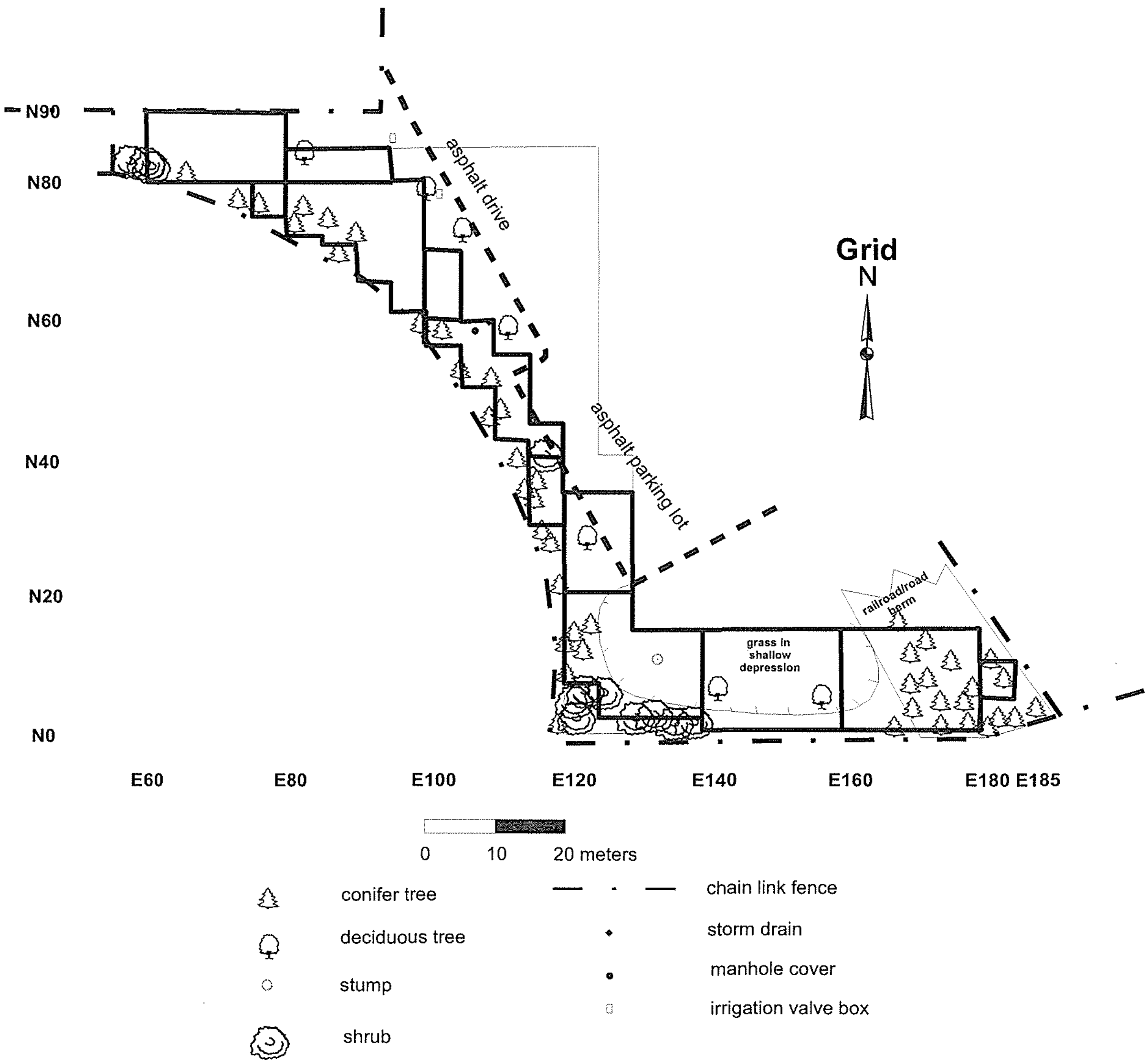


Figure 15. Sketch map of the eastern portion of the south unit in the VNHR Area #3.

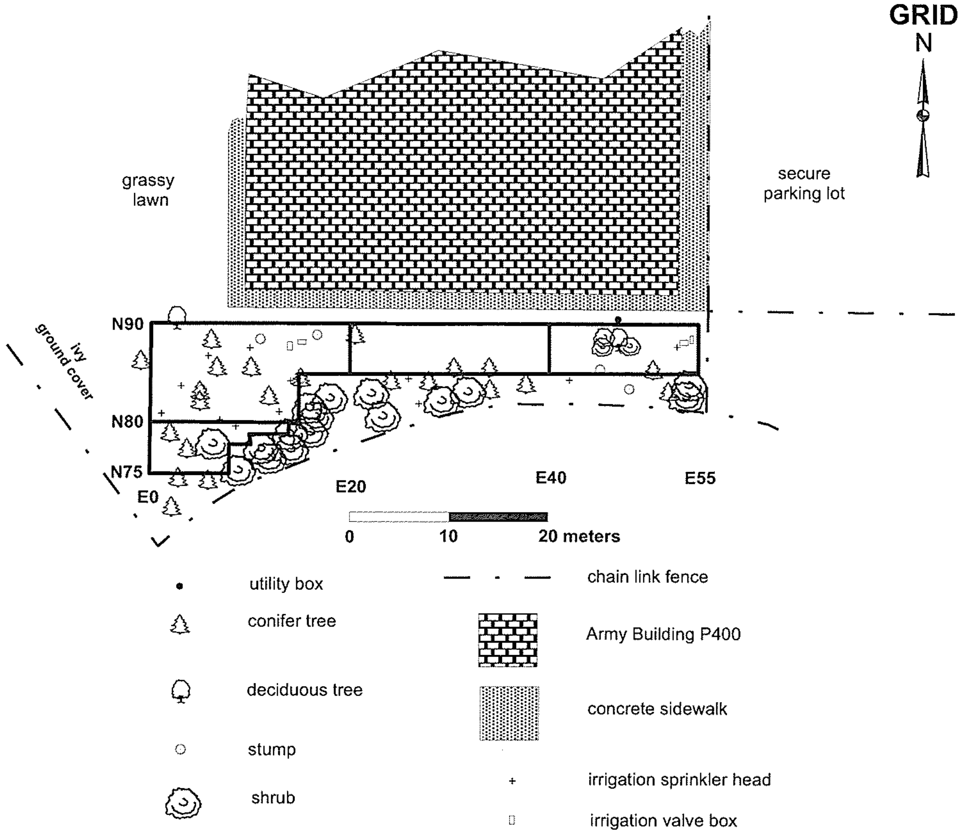


Figure 16. Sketch map of western portion of the south unit in the VNHR Area #3.

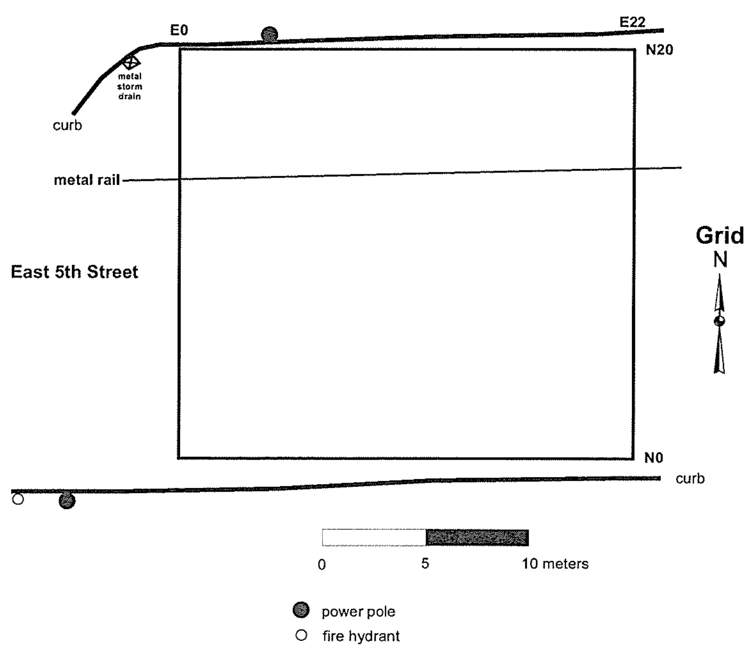


Figure 17. Sketch map of north unit in the VNHR Area #3.

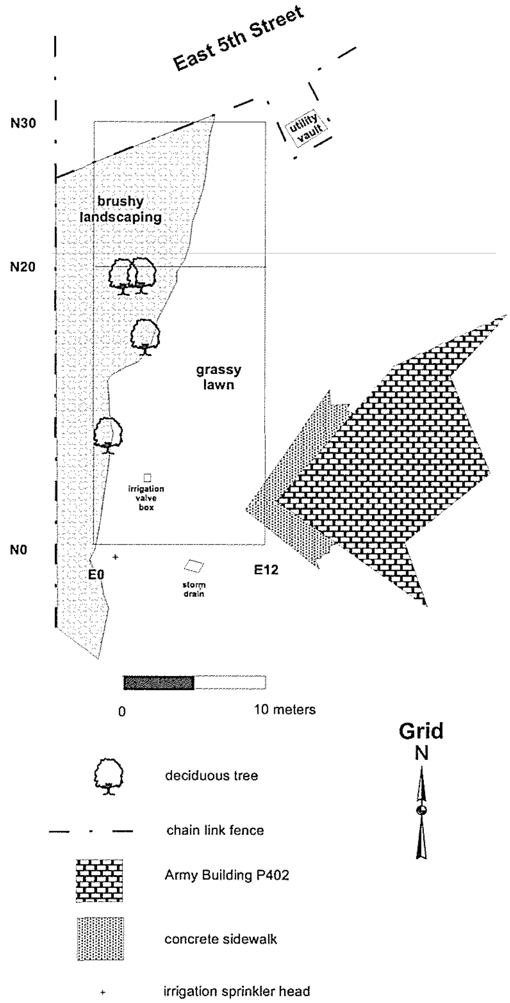


Figure 18. Sketch map of middle unit in the VNHR Area #3.

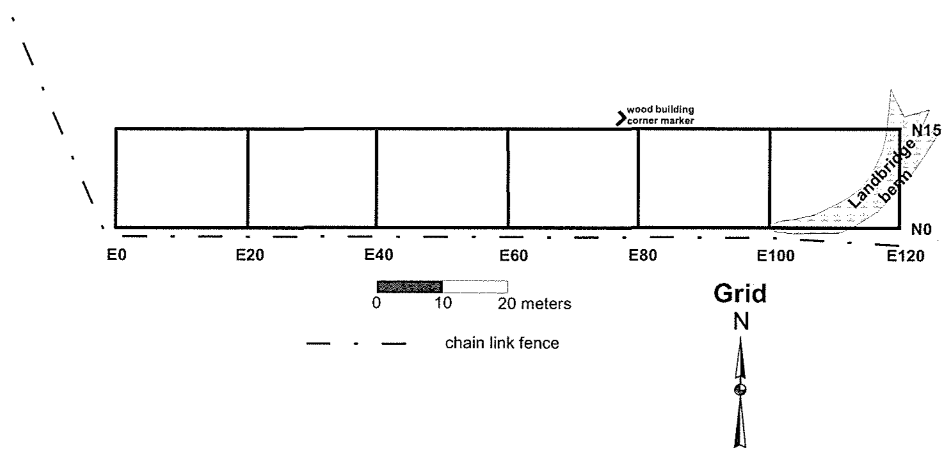


Figure 19. Sketch map of the VNHR Area #4.

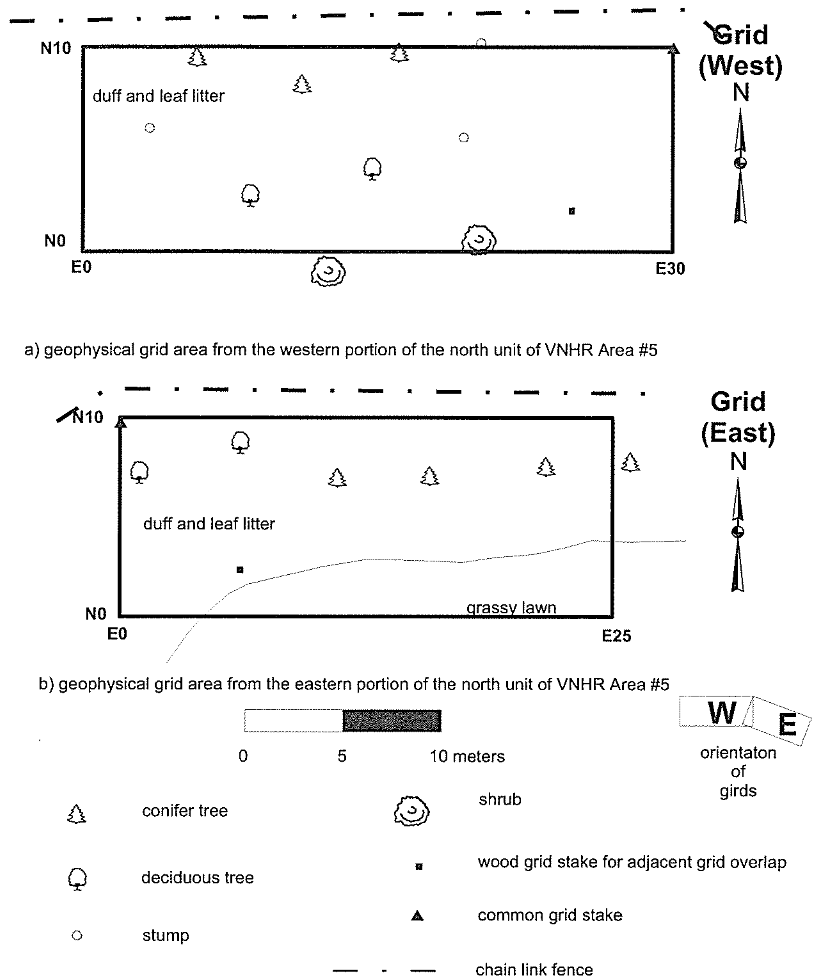


Figure 20. Sketch map of the north unit in the VNHR Area #5.

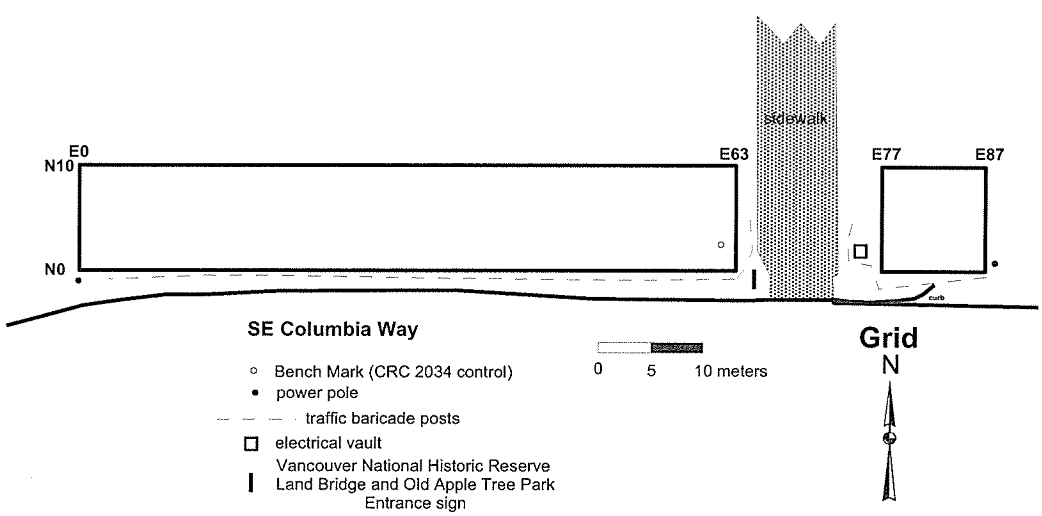


Figure 21. Sketch map of south unit in the VNHR Area #5.

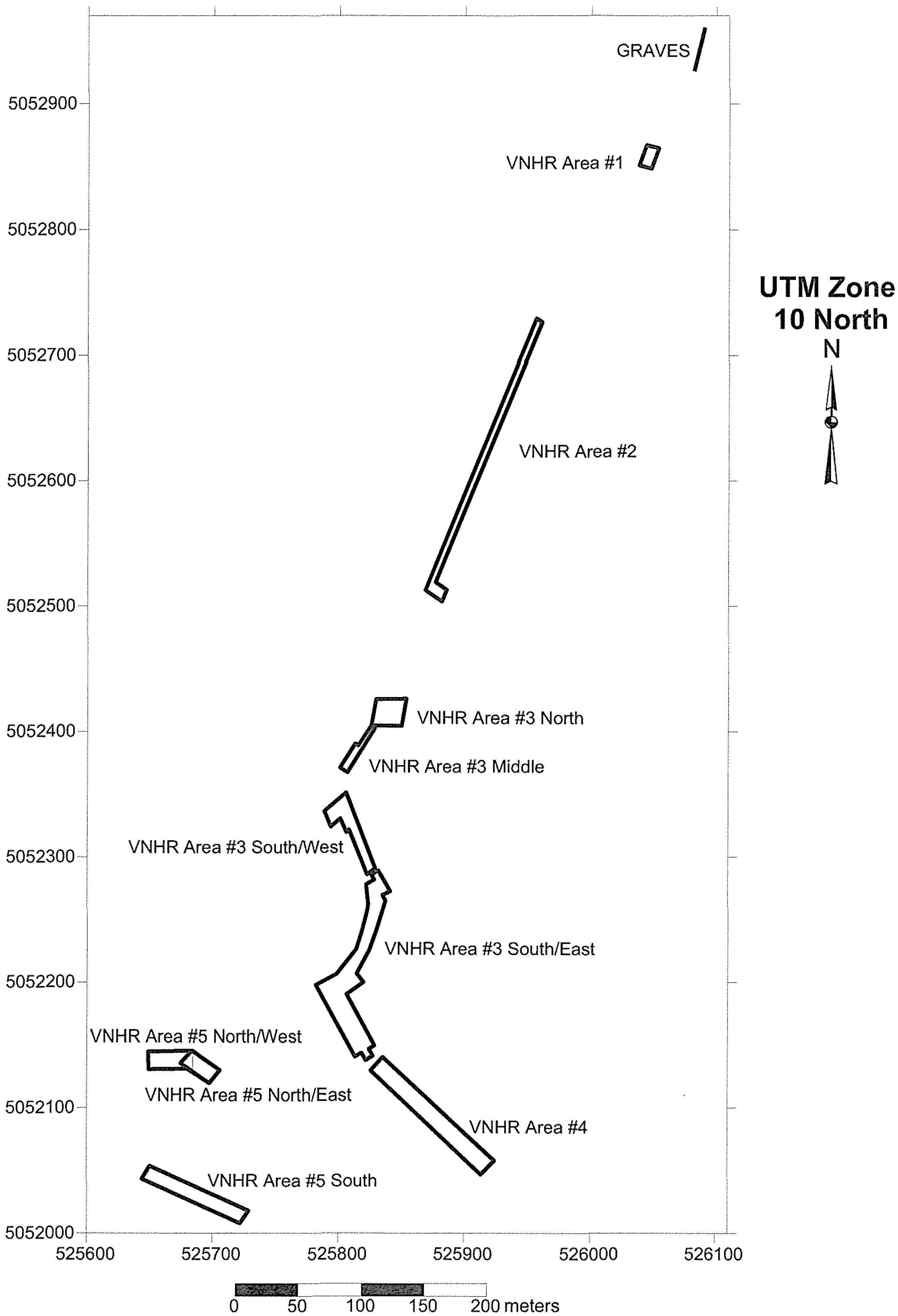


Figure 22. UTM readings for the CRC project areas within the VNHR.

Figure 23. Survey ropes on ground penetrating radar project area in western portion of the south unit of VNHR Area #3 (view to the southeast).

Figure 24. Ground penetrating radar cart system with 400 MHz antenna (view to the northwest).

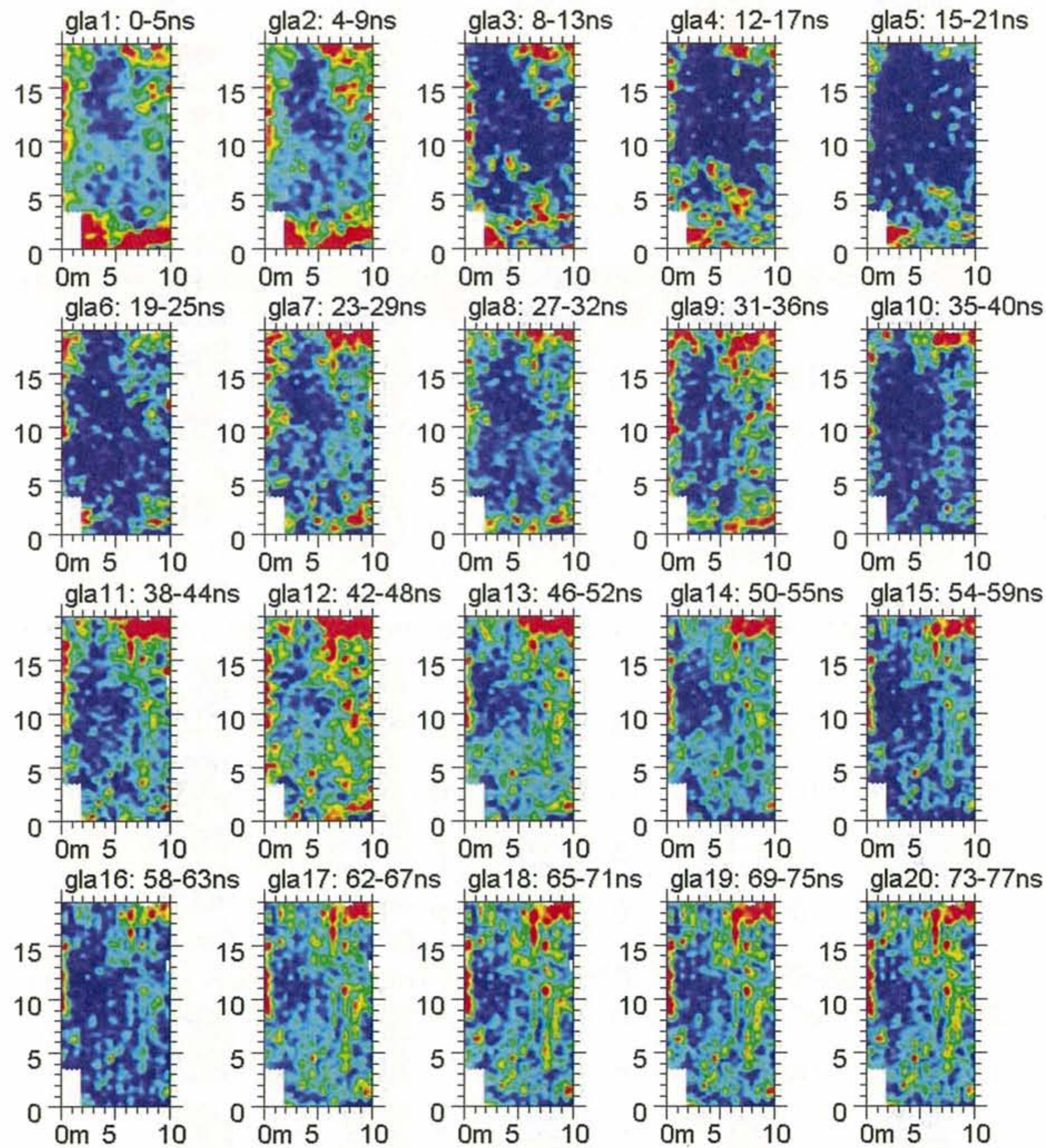


Figure 25. Ground penetrating radar time slices from VNHR Area #1.

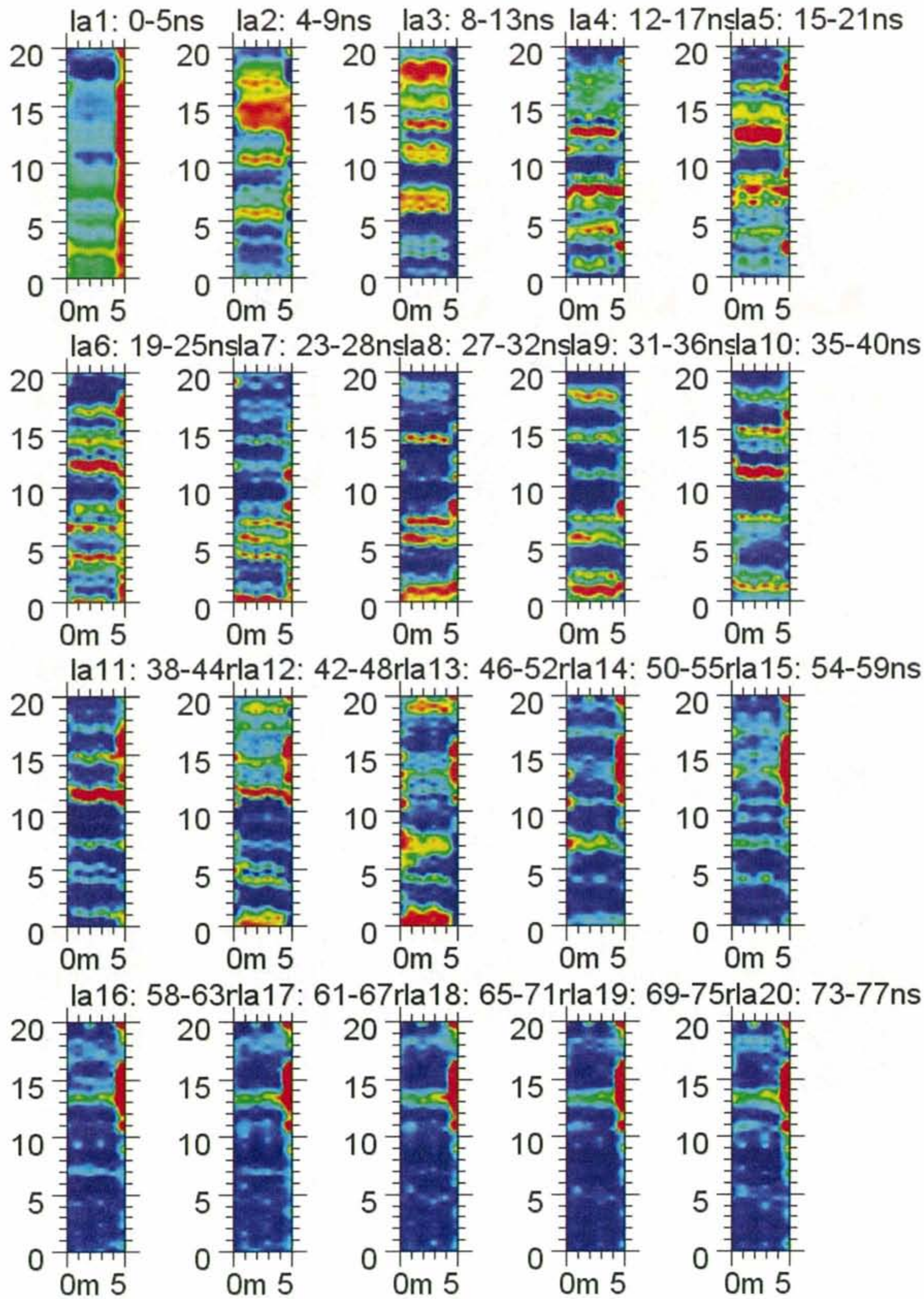


Figure 26. Ground penetrating radar time slices from the GRAVES area northeast of VNHR #1.

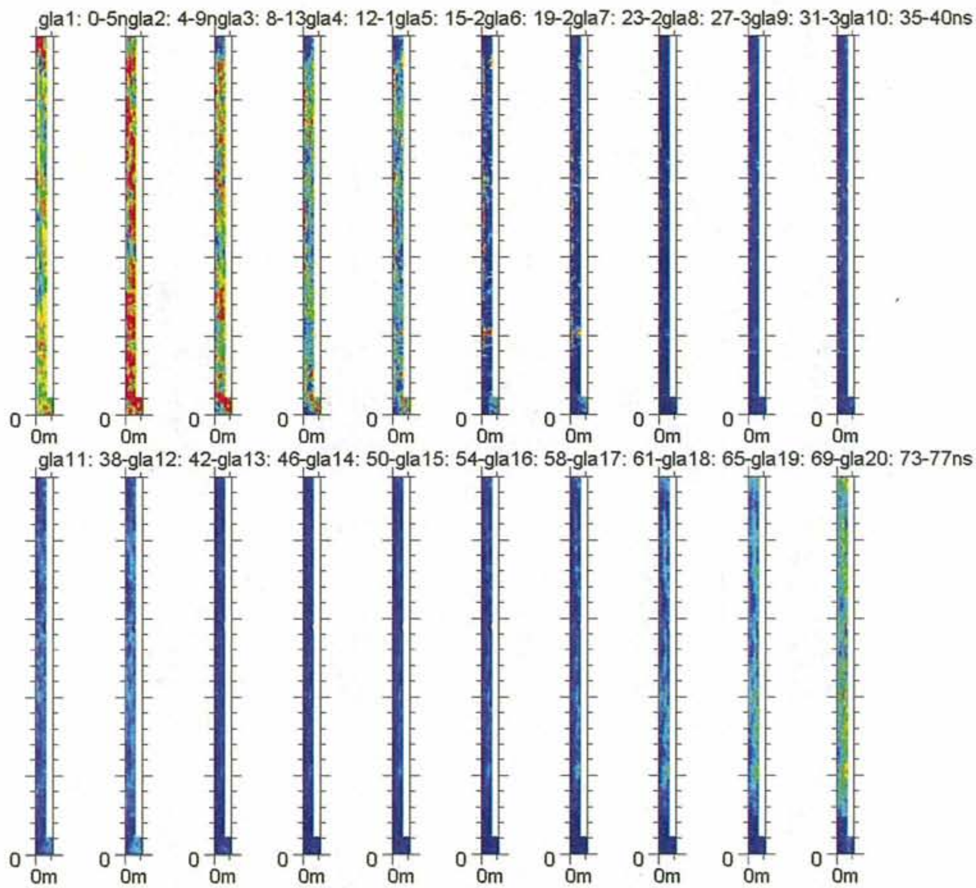


Figure 27. Ground penetrating radar time slices from VNHR #2.

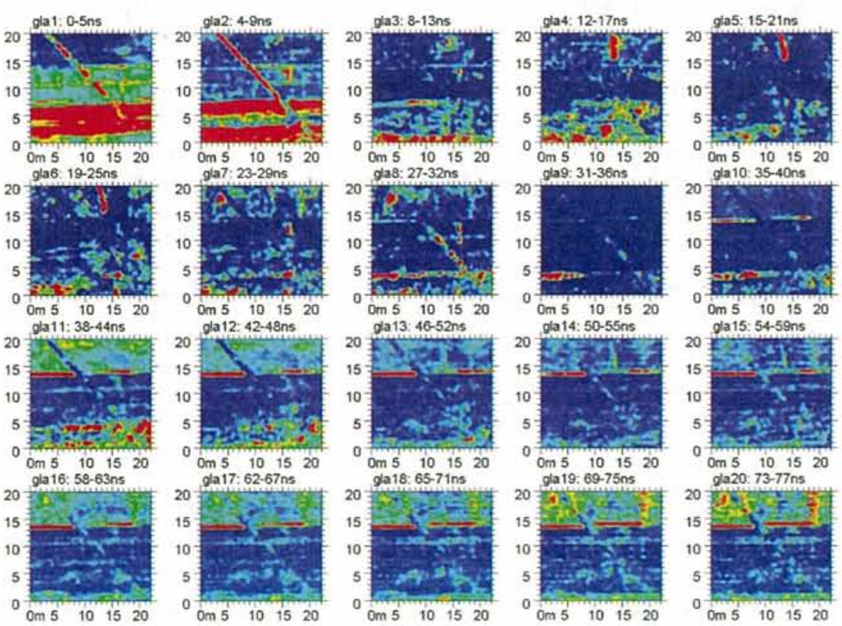


Figure 28. Ground penetrating radar time slices from the north unit of VNHR #3.

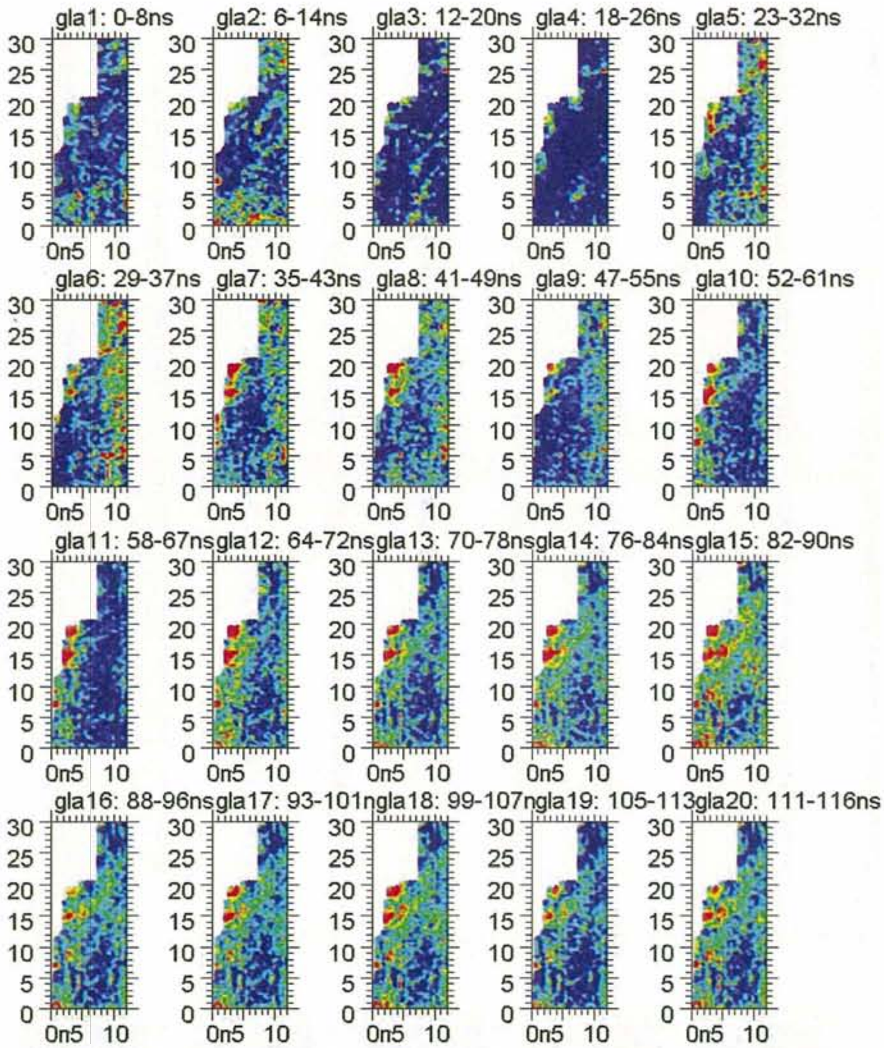


Figure 29. Ground penetrating radar time slices from the middle unit of VNHR #3.

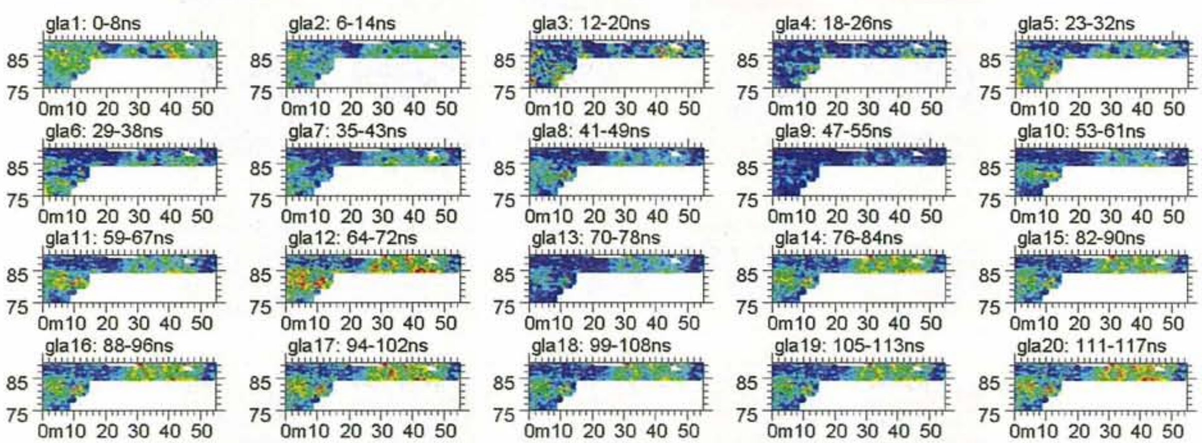


Figure 30. Ground penetrating radar time slices from the western portion of the south unit of VNHR Area #3.

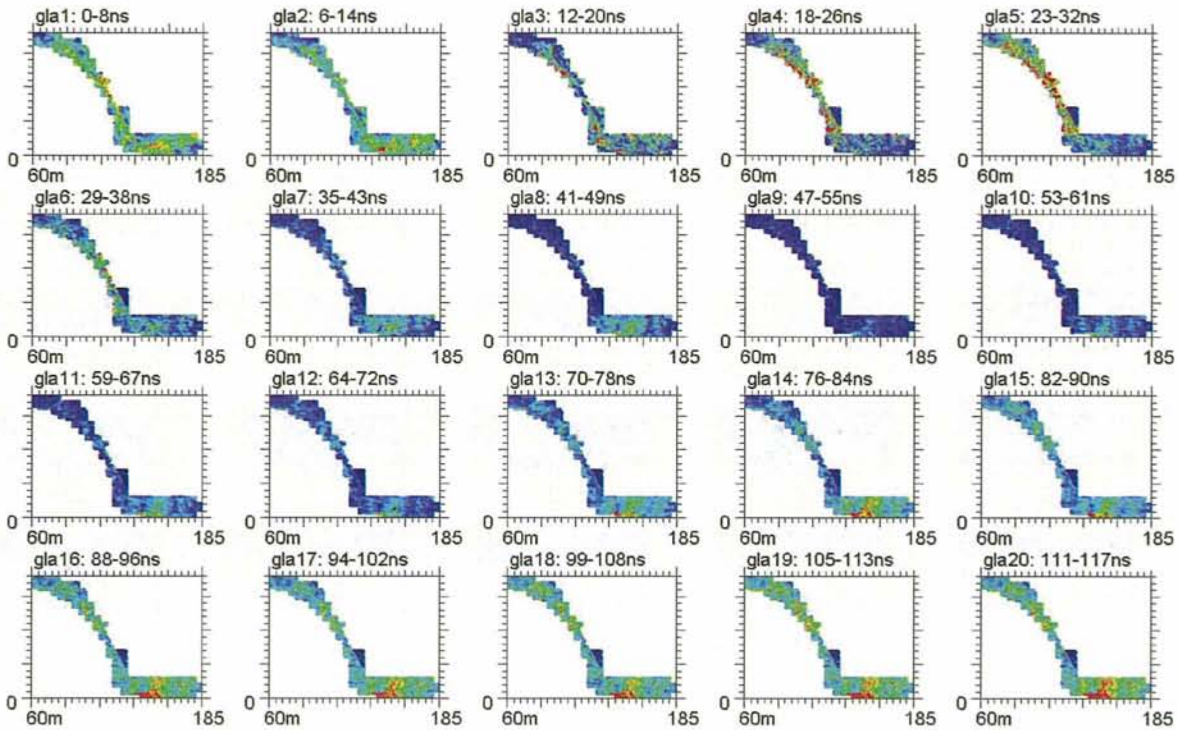


Figure 31. Ground penetrating radar time slices from the eastern portion of the south unit of VNHR Area #3.

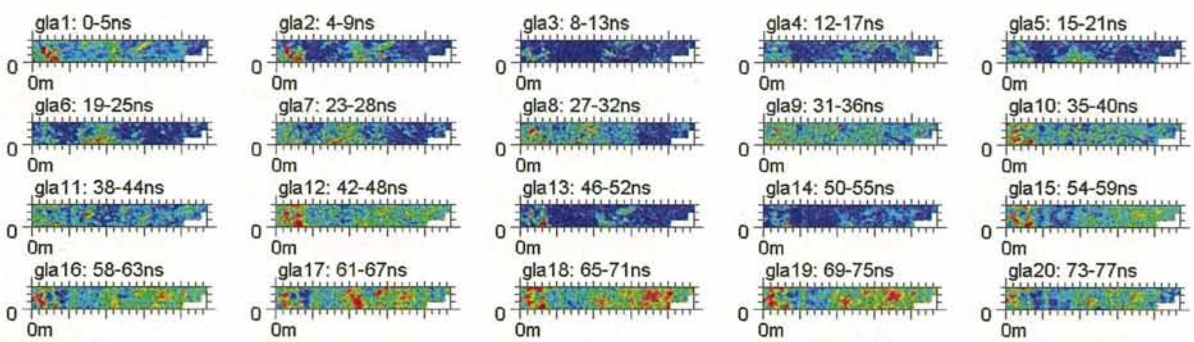


Figure 32. Ground penetrating radar time slices from VNHR #4.

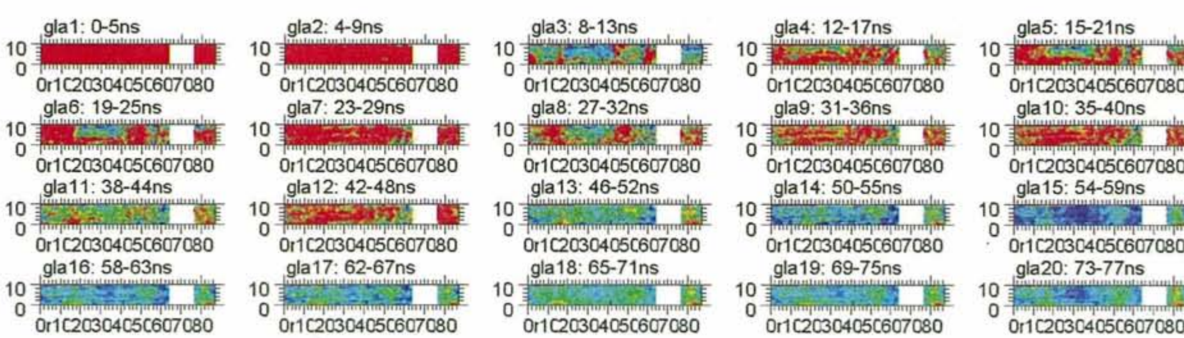
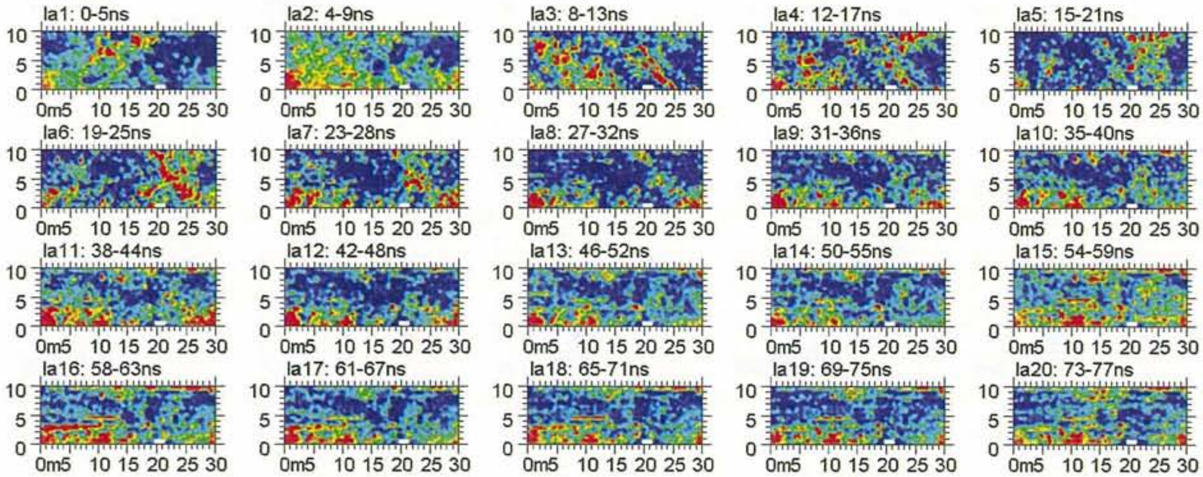
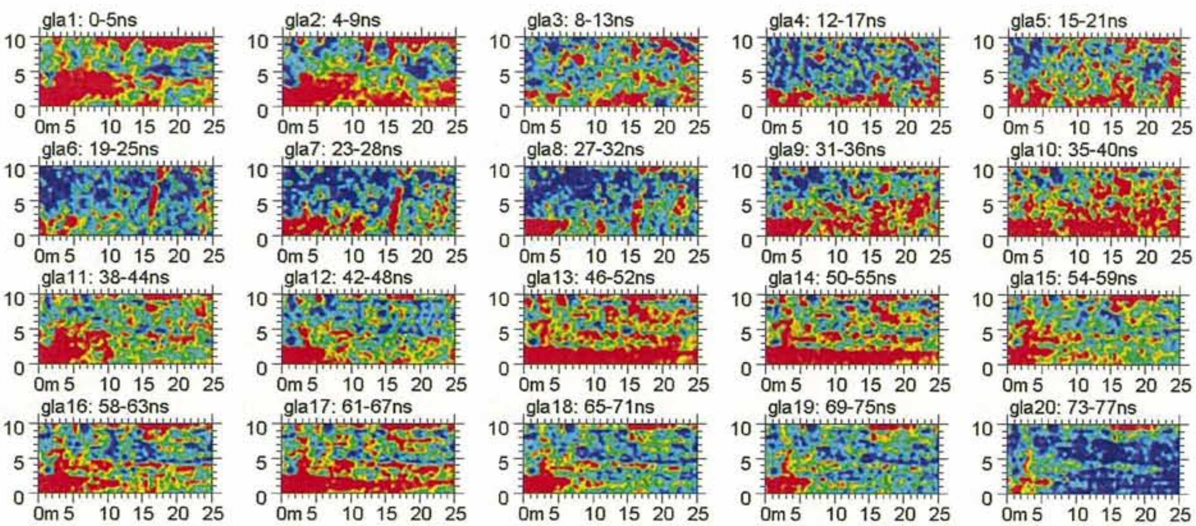


Figure 33. Ground penetrating radar time slices from the southern unit of VNHR Area #5.



a) western portion of north unit of the VNHR Area #5



b) eastern portion of north unit of VNHR Area #5

Figure 34. Ground penetrating radar time slices from the north unit of VNHR Area #5.

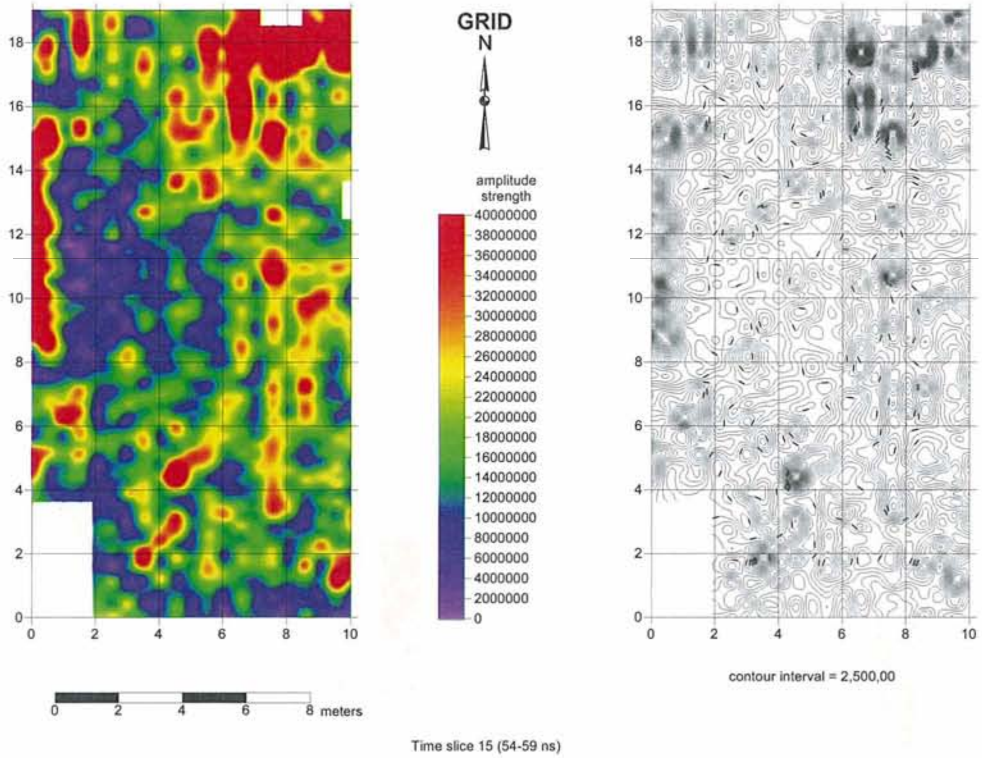


Figure 35. Image and contour plots of the ground penetrating radar time slice 15 data from VNHR Area #1.

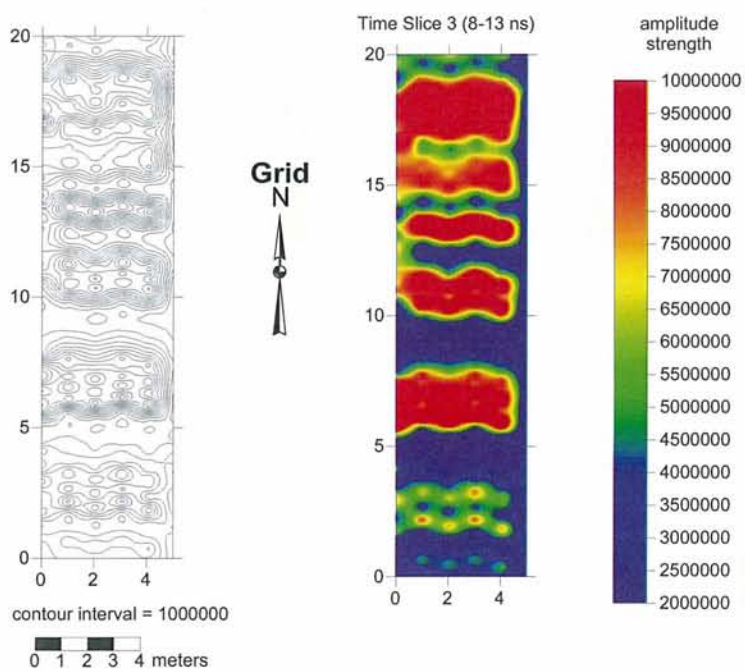


Figure 36. Image and contour data plots from the GPR traverses across the grave locations (GRAVES) in the Officers Quarters parking lot.

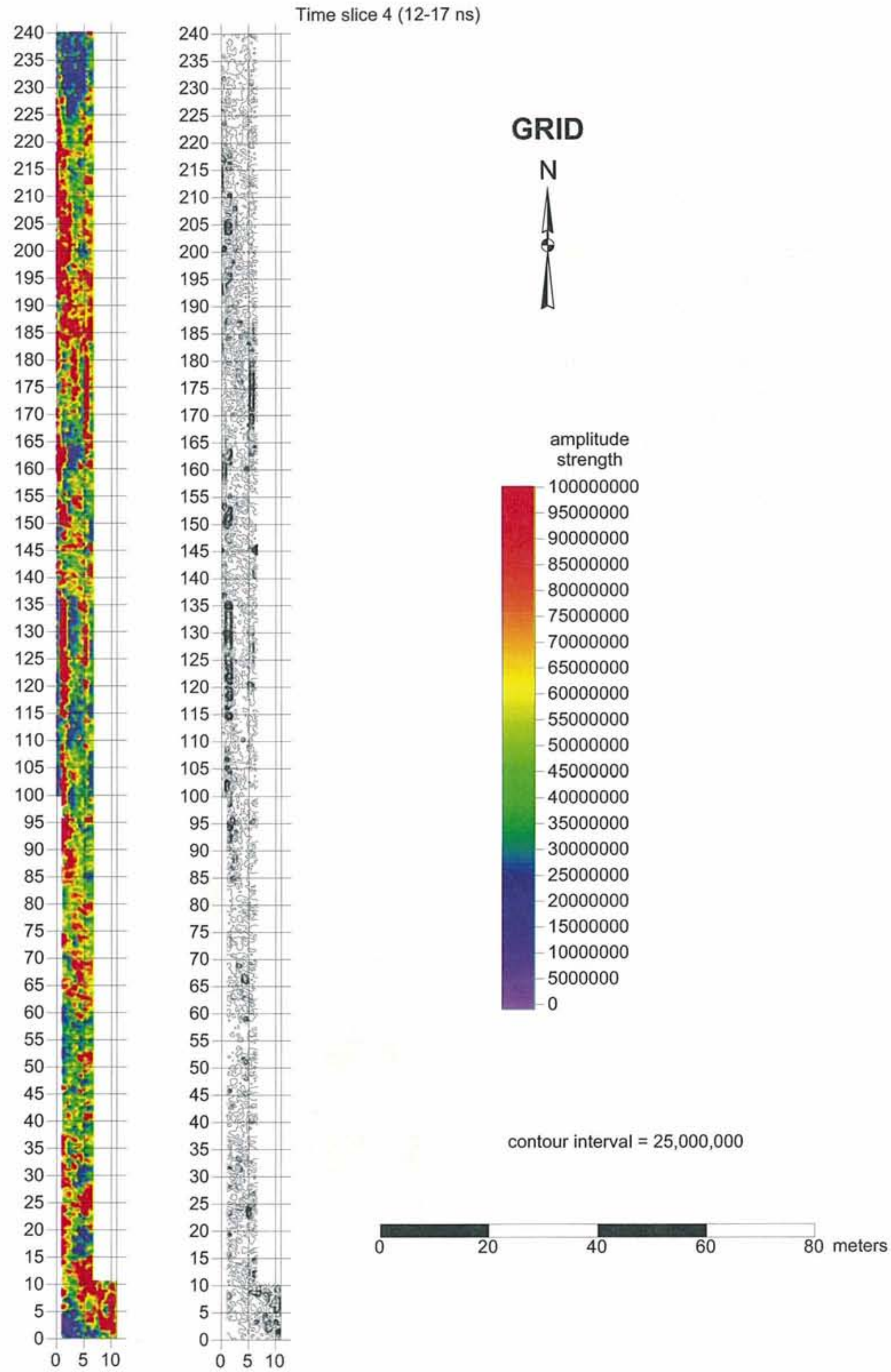


Figure 37. Image and contour plots of the ground penetrating radar time slice 4 data from VNHR Area #2.

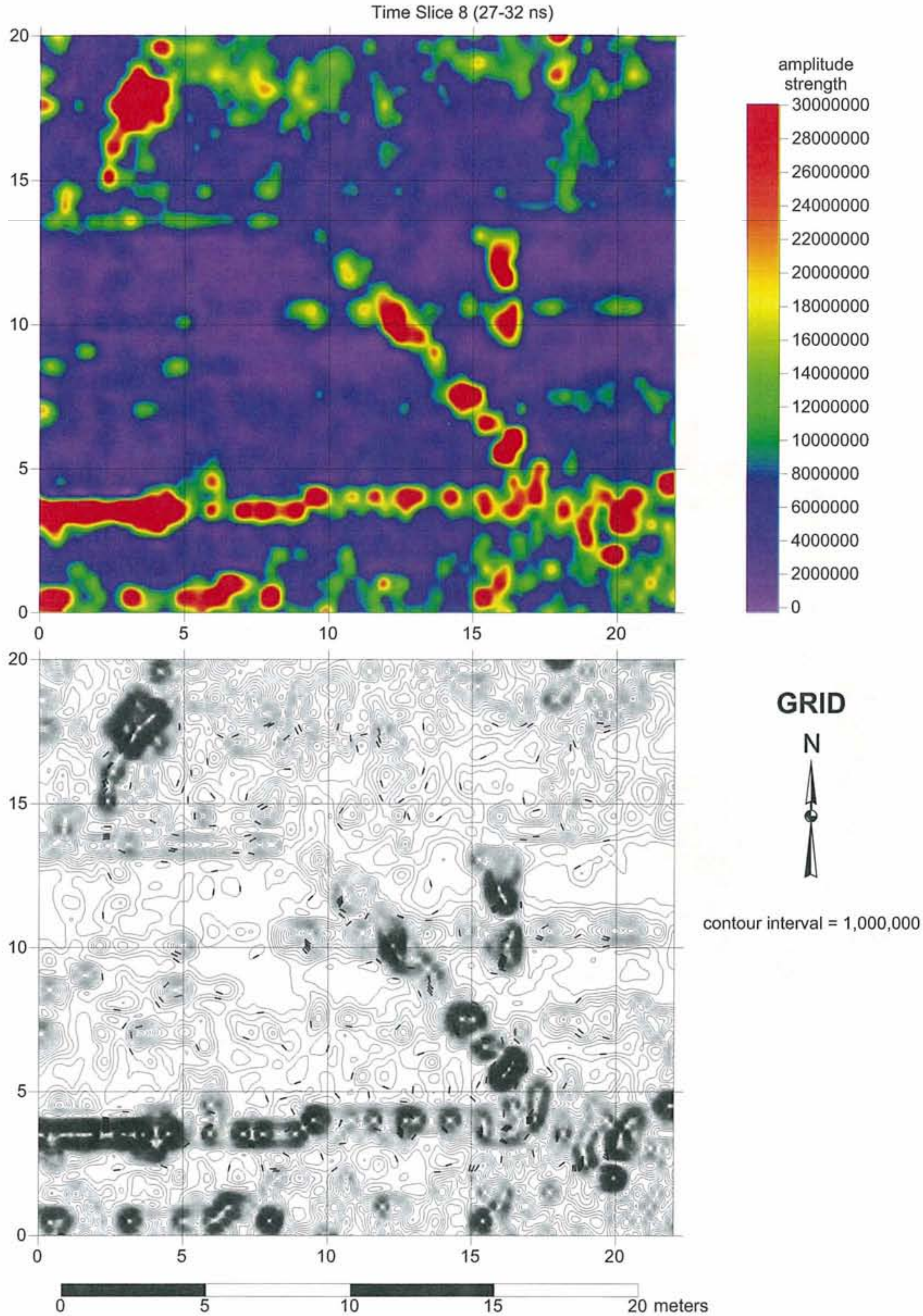


Figure 38. Image and contour data plots from the ground penetrating radar time slice 8 data from the northern unit of the VNHR Area #3.

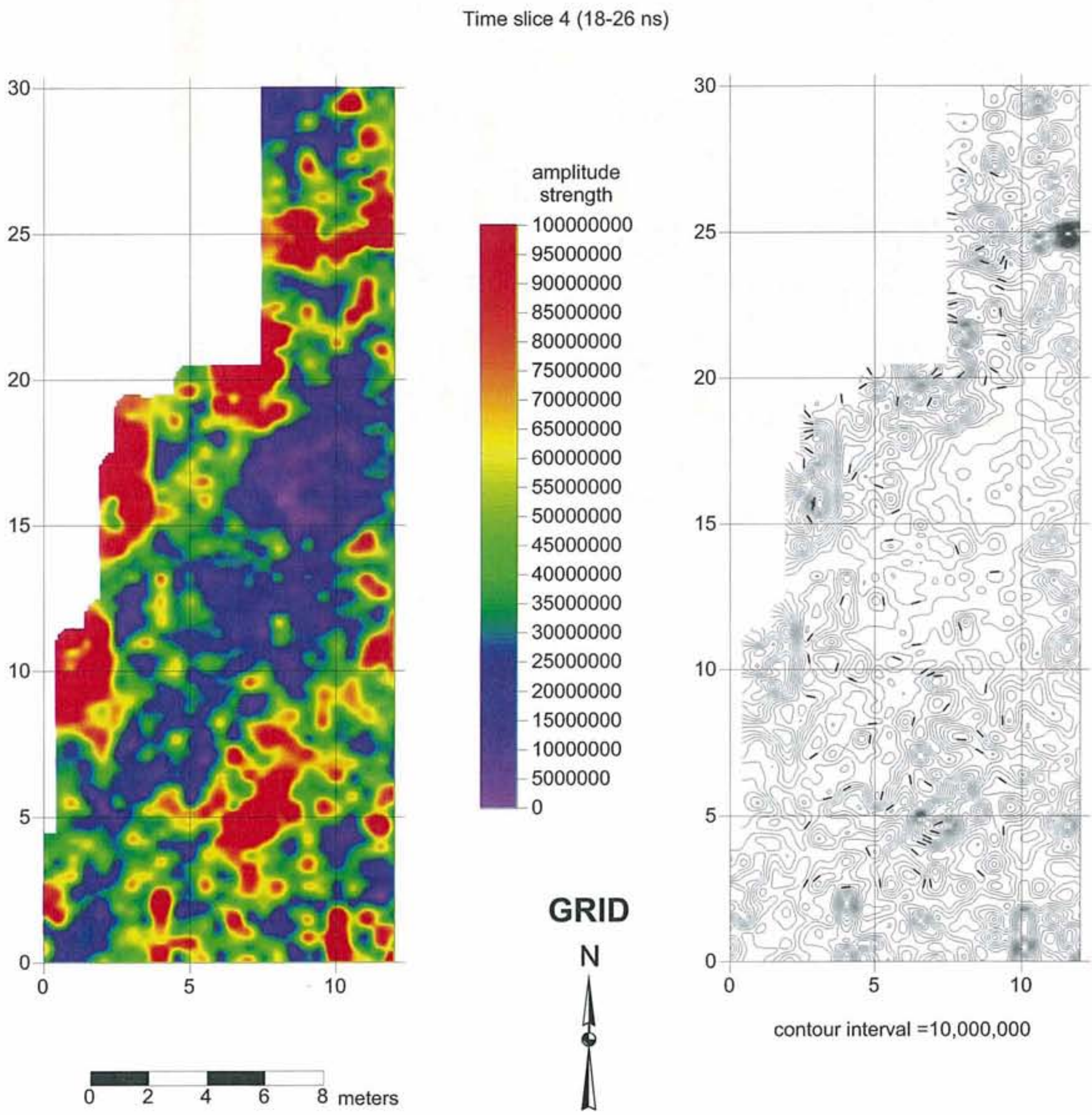


Figure 39. Image and contour data plots from the ground penetrating radar time slice 4 data from the middle unit of the VNHR Area #3.

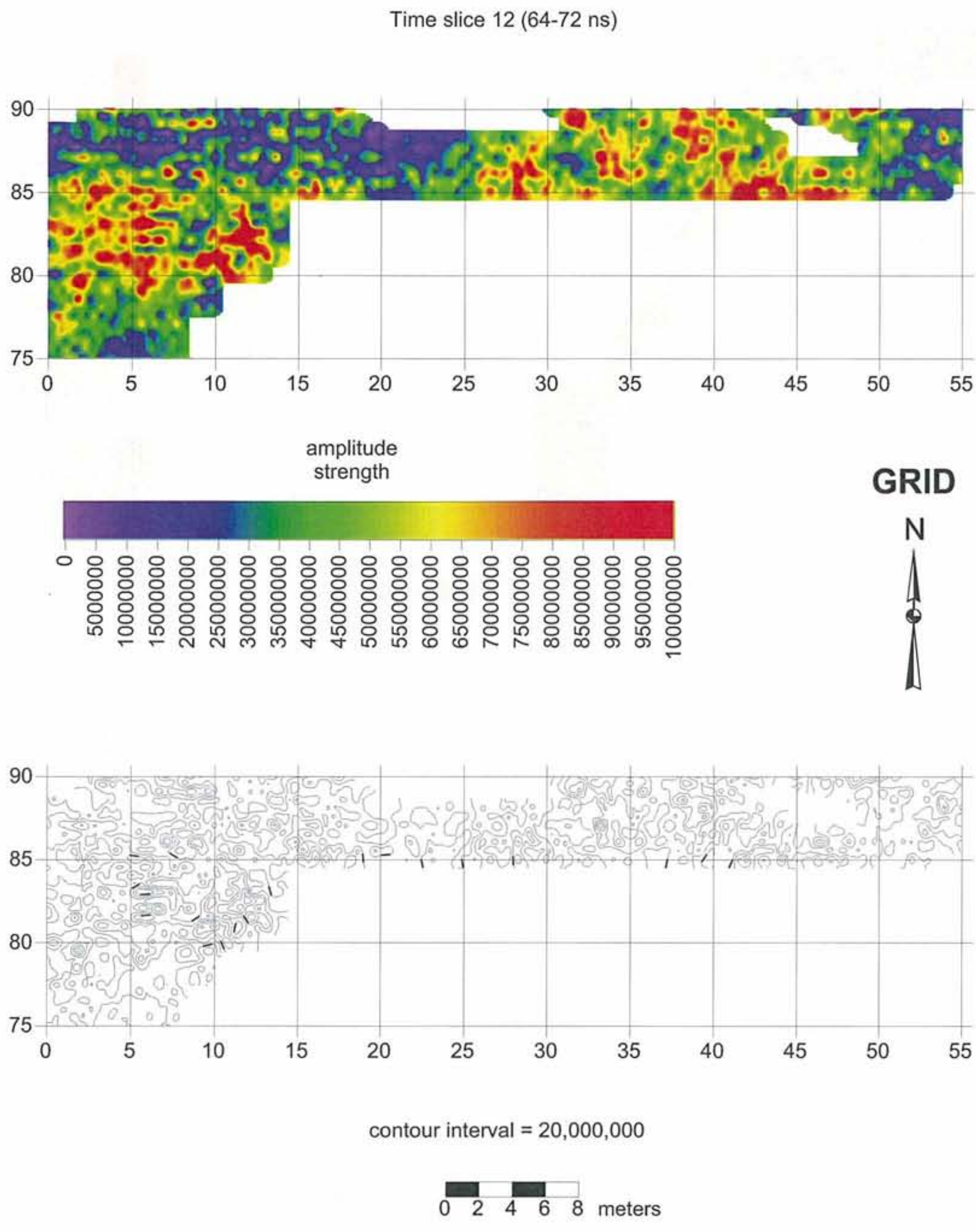


Figure 40. Image and contour plots of the ground penetrating radar time slice 12 data from the western portion of the south unit of VNHR Area #3.

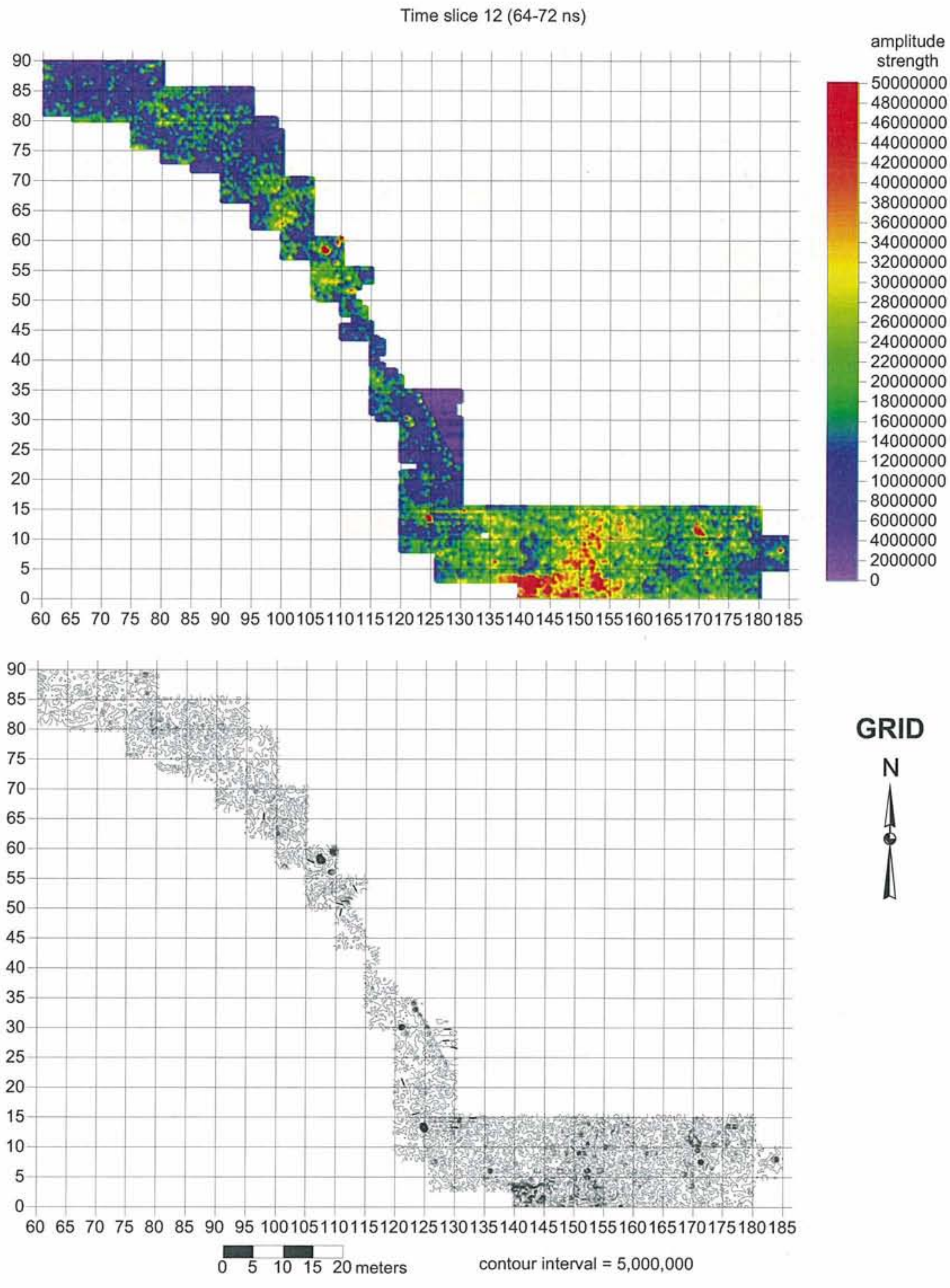


Figure 41. Image and contour plots of the ground penetrating radar time slice 12 data from the eastern portion of the south unit of VNHR Area #3.

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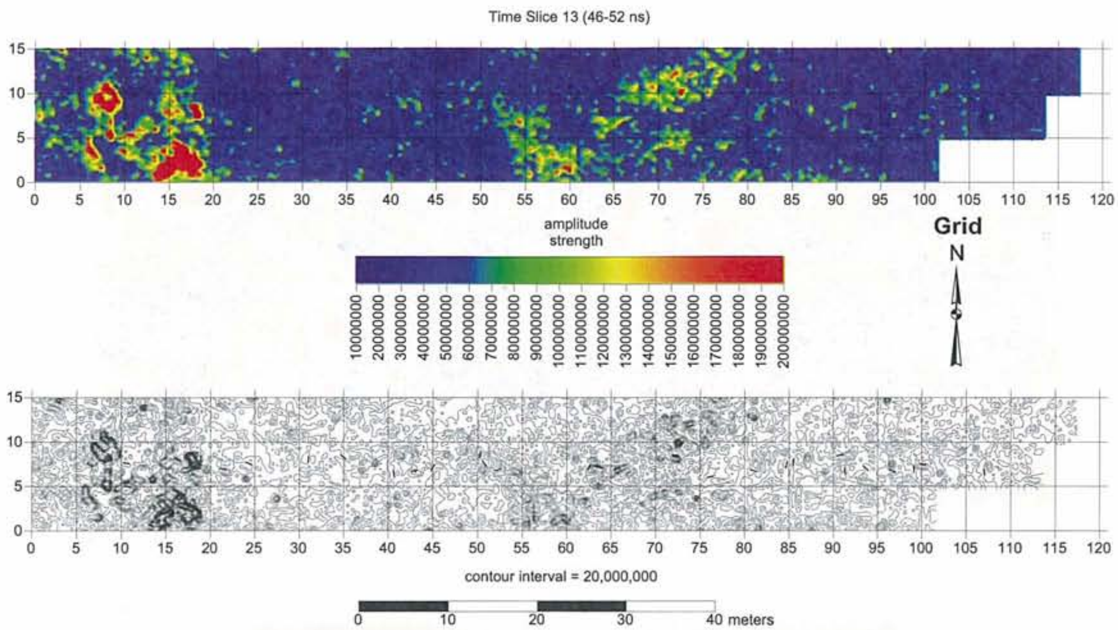

Figure 42. Image and contour data plots form the ground penetrating radar time slice 13 data from VNHR Area #4.

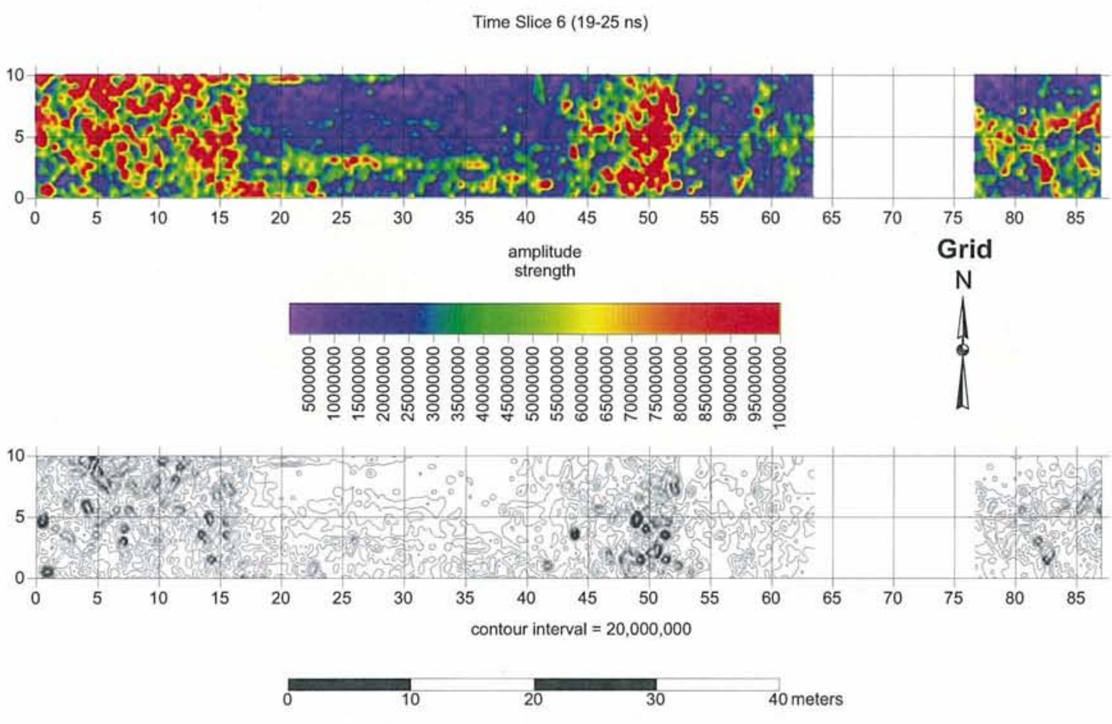

Figure 43. Image and contour data plots from the ground penetrating radar time slice 6 data from the south unit of VNHR Area #5.

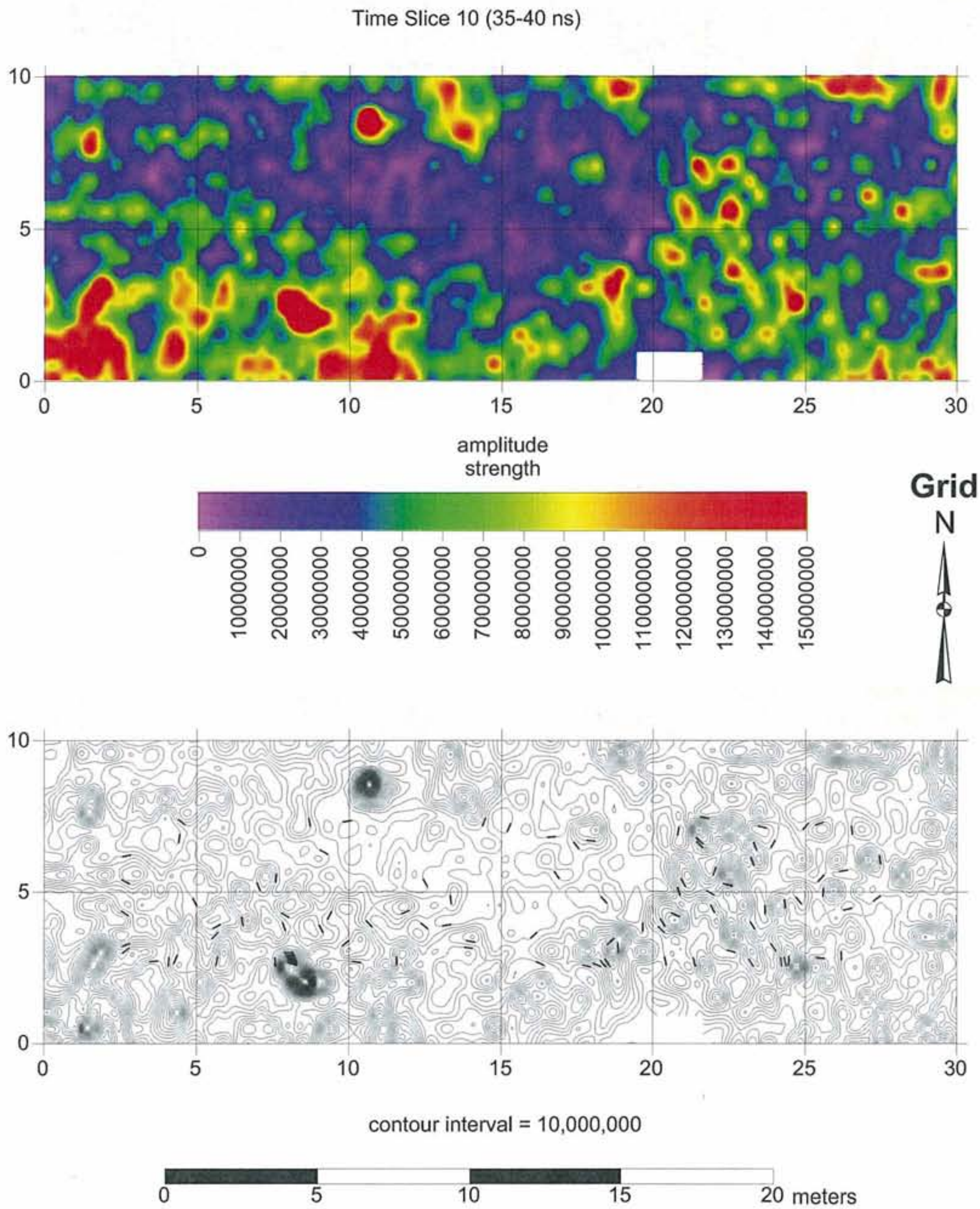

Figure 44. Image and contour data plots from the ground penetrating radar time slice 10 data from the western portion of the north unit of VNHR Area #5.

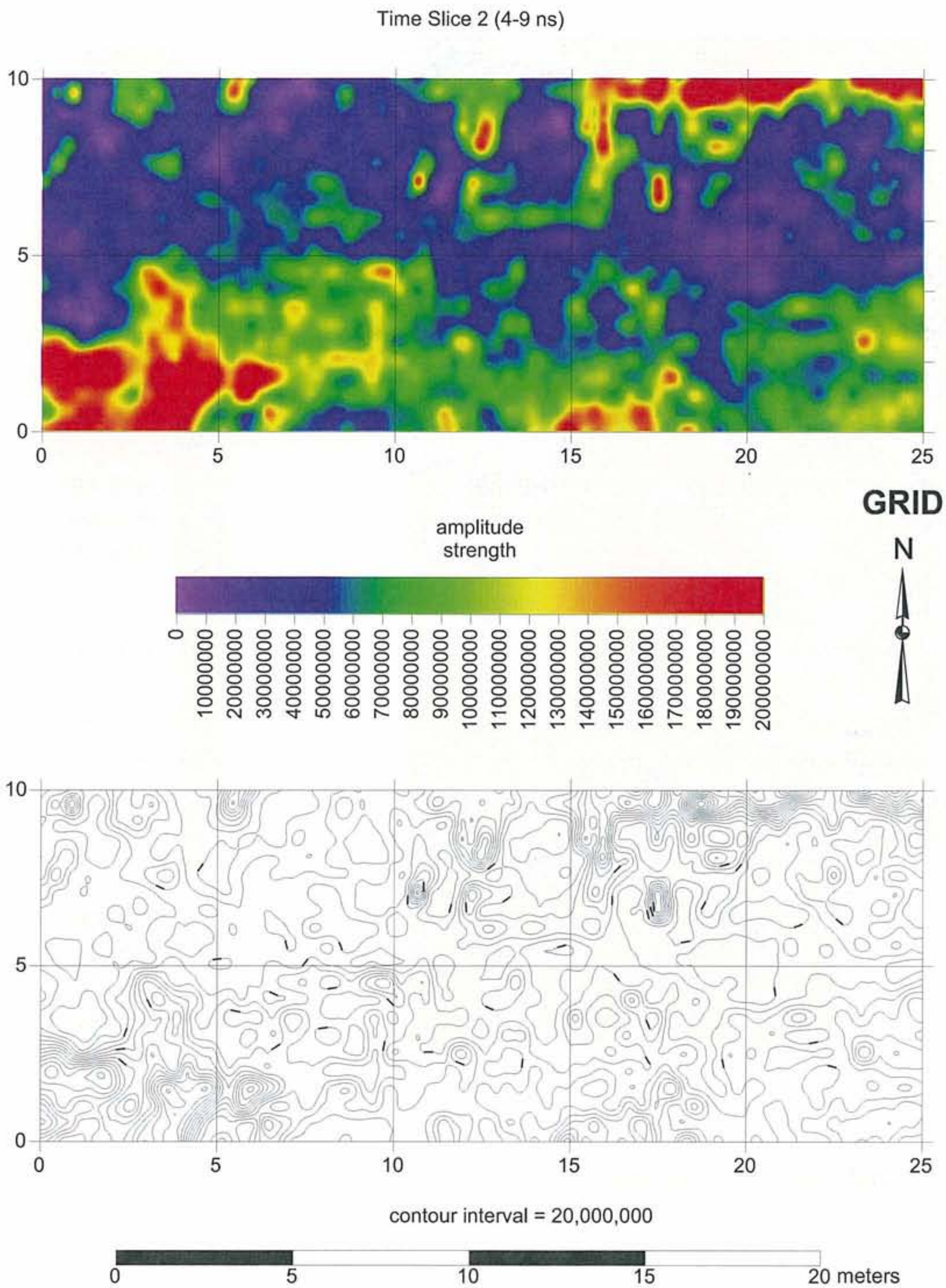

Figure 45. Image and contour data plots from the ground penetrating radar time slice 10 data from the eastern portion of the north unit of VNHR Area #5.

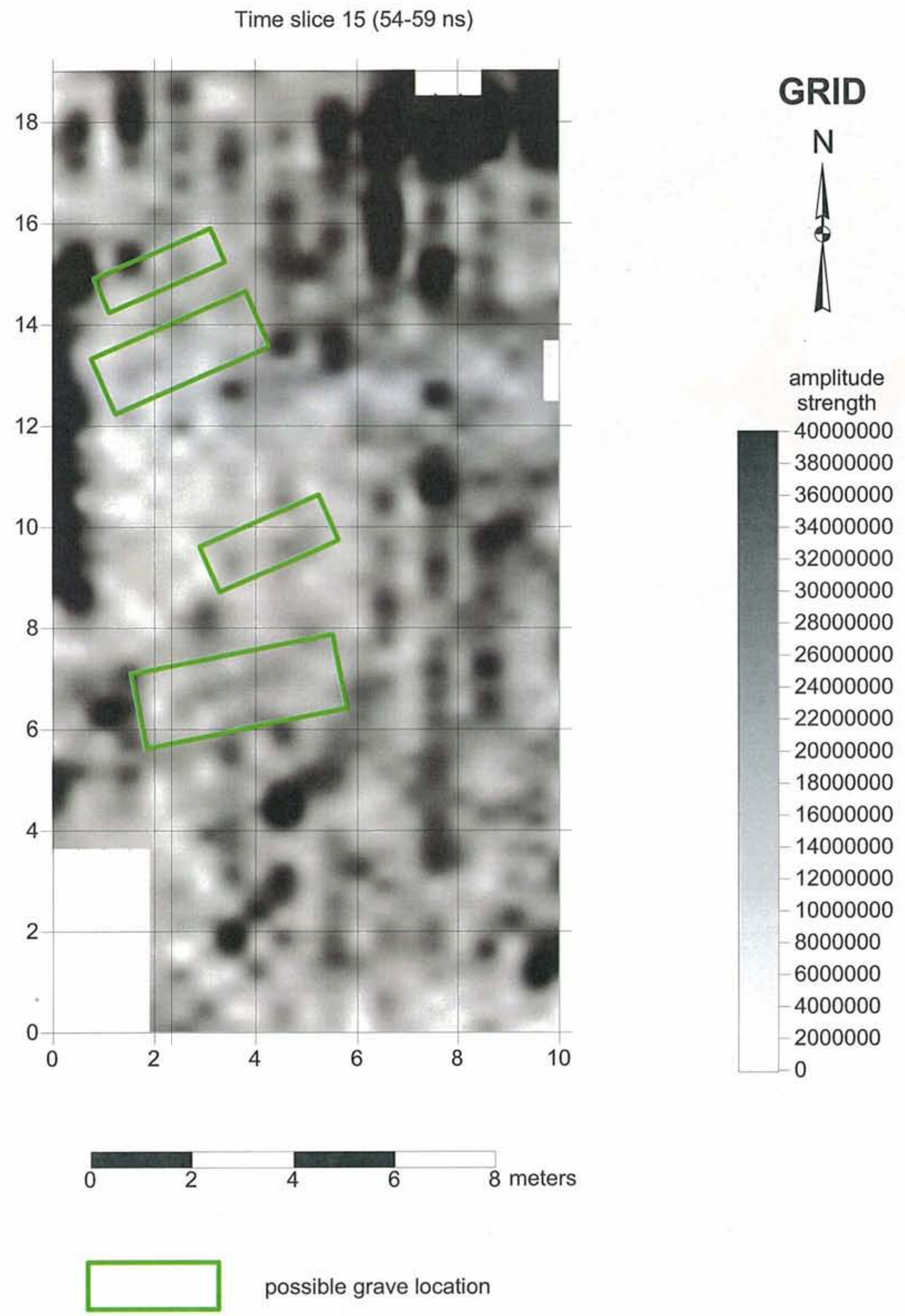

Figure 46. Interpretation of ground penetrating radar time slice 15 from VNHR Area #1.

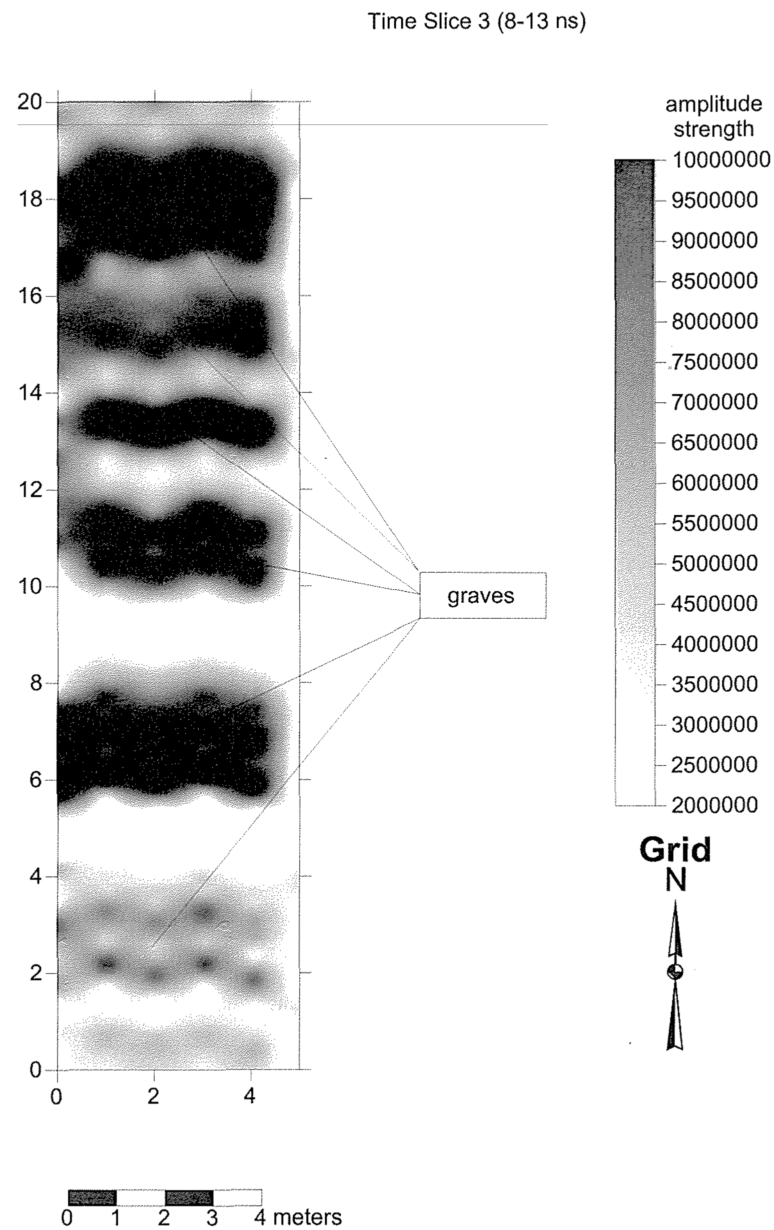

Figure 47. Interpretation of ground penetrating radar time slice from the GRAVES project area.

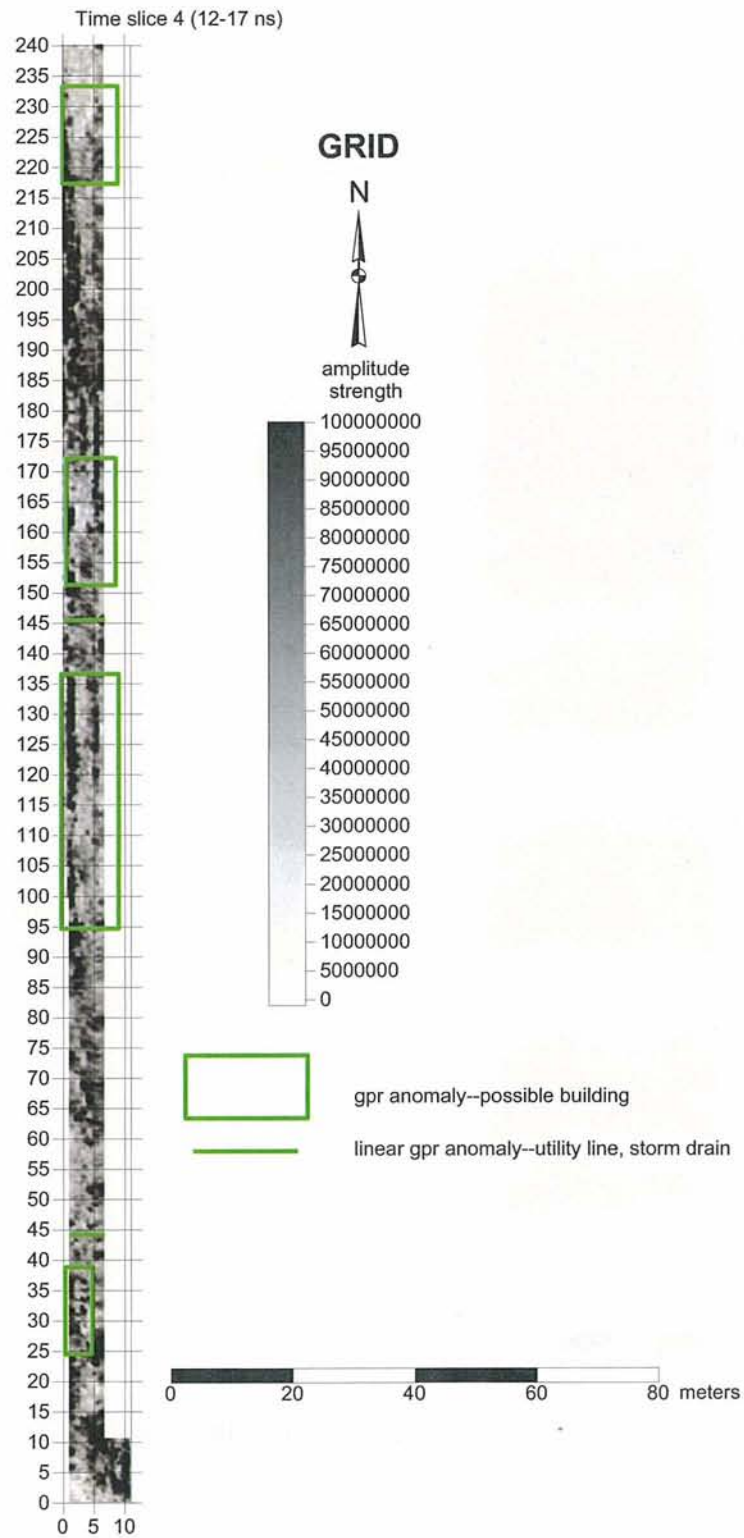

Figure 48. Interpretation of ground penetrating radar time slice 4 from VNHR Area #2.

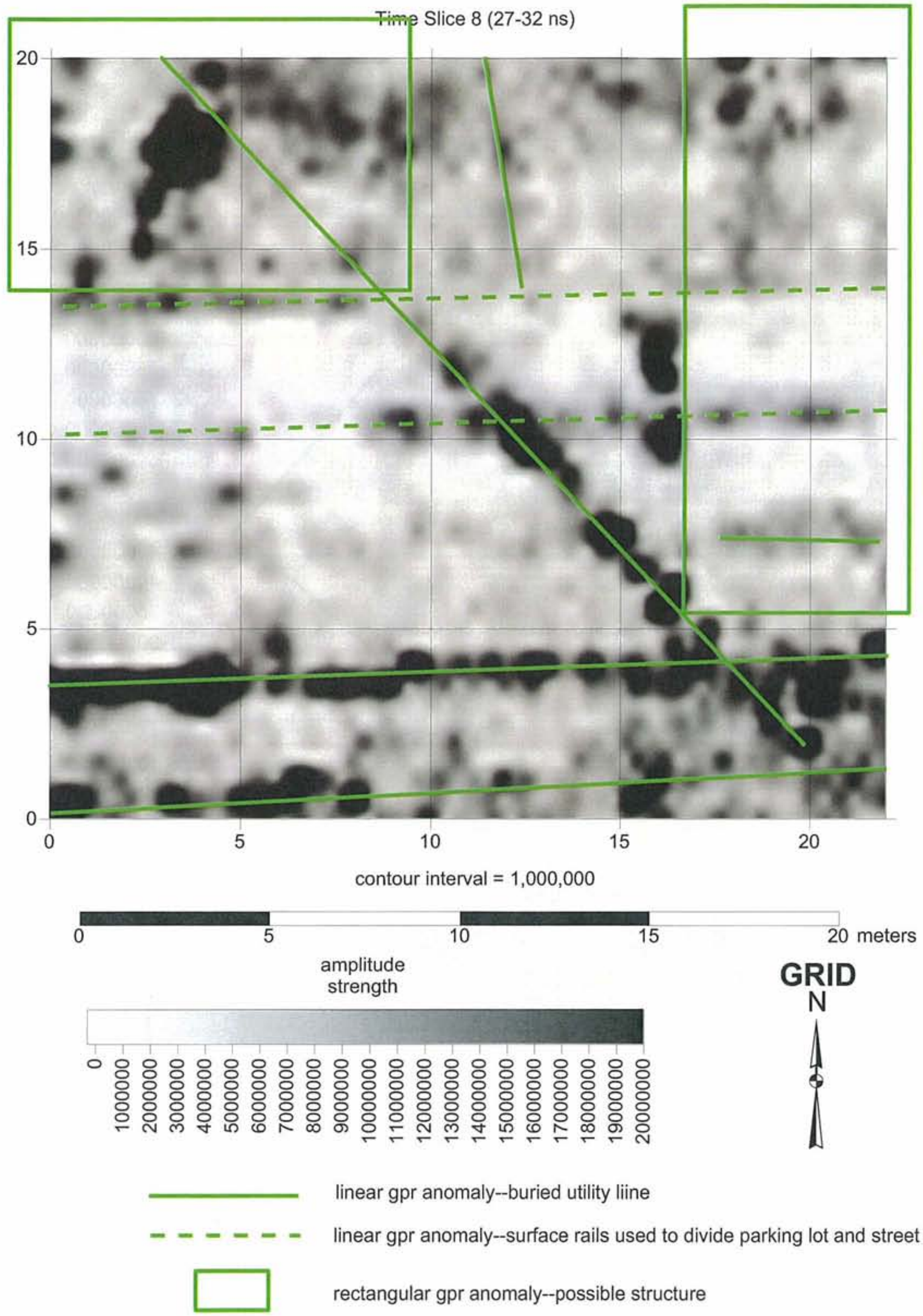

Figure 49. Interpretation of ground penetrating radar time slice 8 from the north unit in VNHR Area #3.

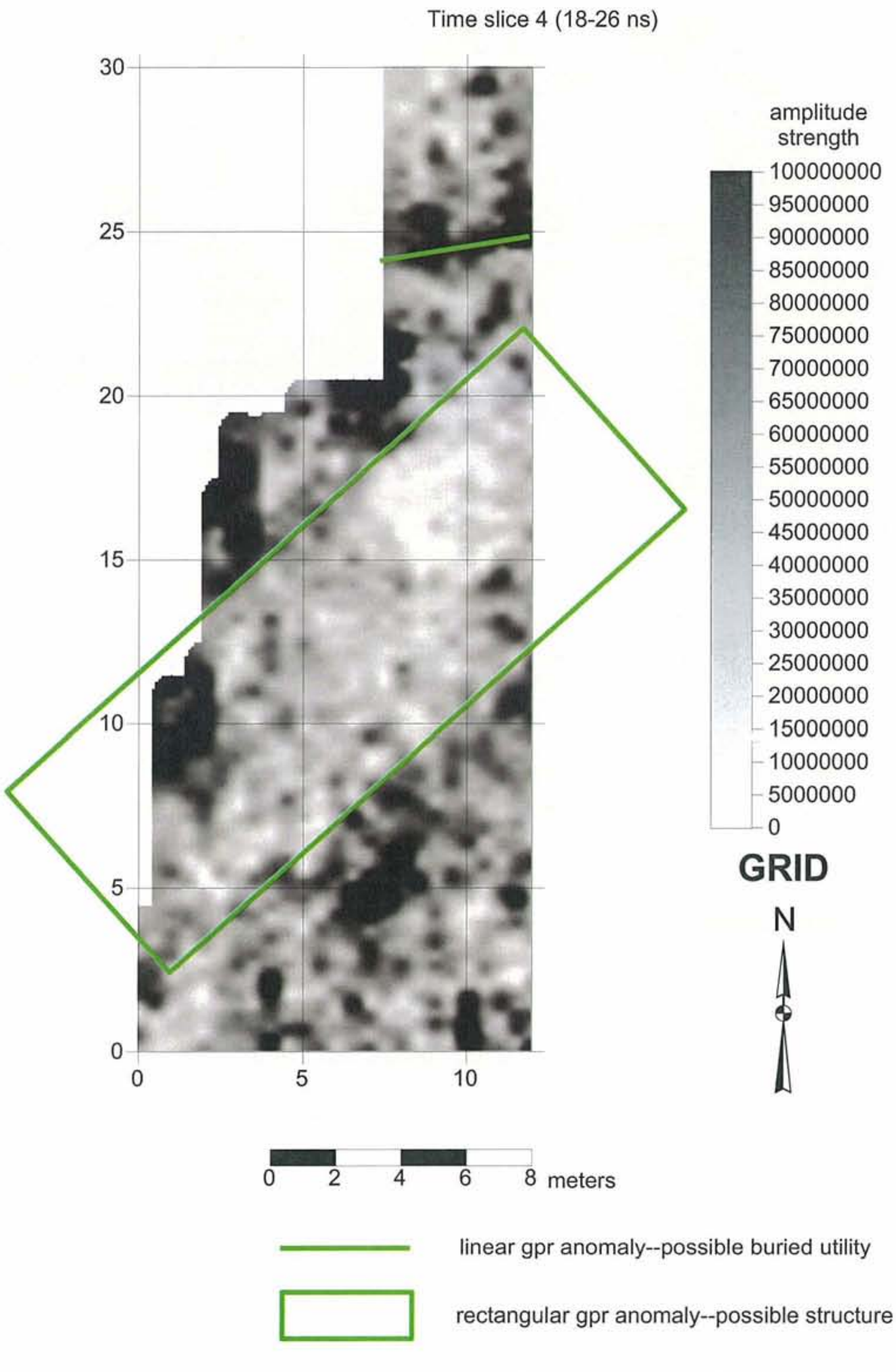

Figure 50. Interpretation of ground penetrating radar time slice 4 from the middle unit in VNHR Area #3.

9770

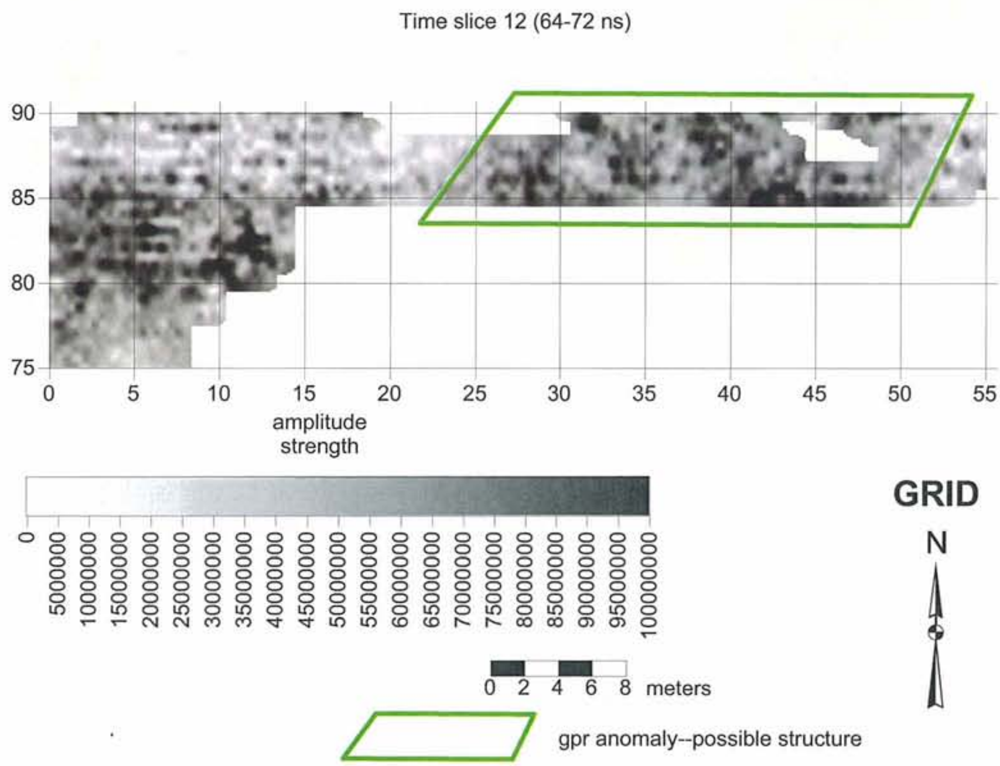

Figure 51. Interpretation of ground penetrating radar time slice 12 from the western portion of in VNHR Area #3.

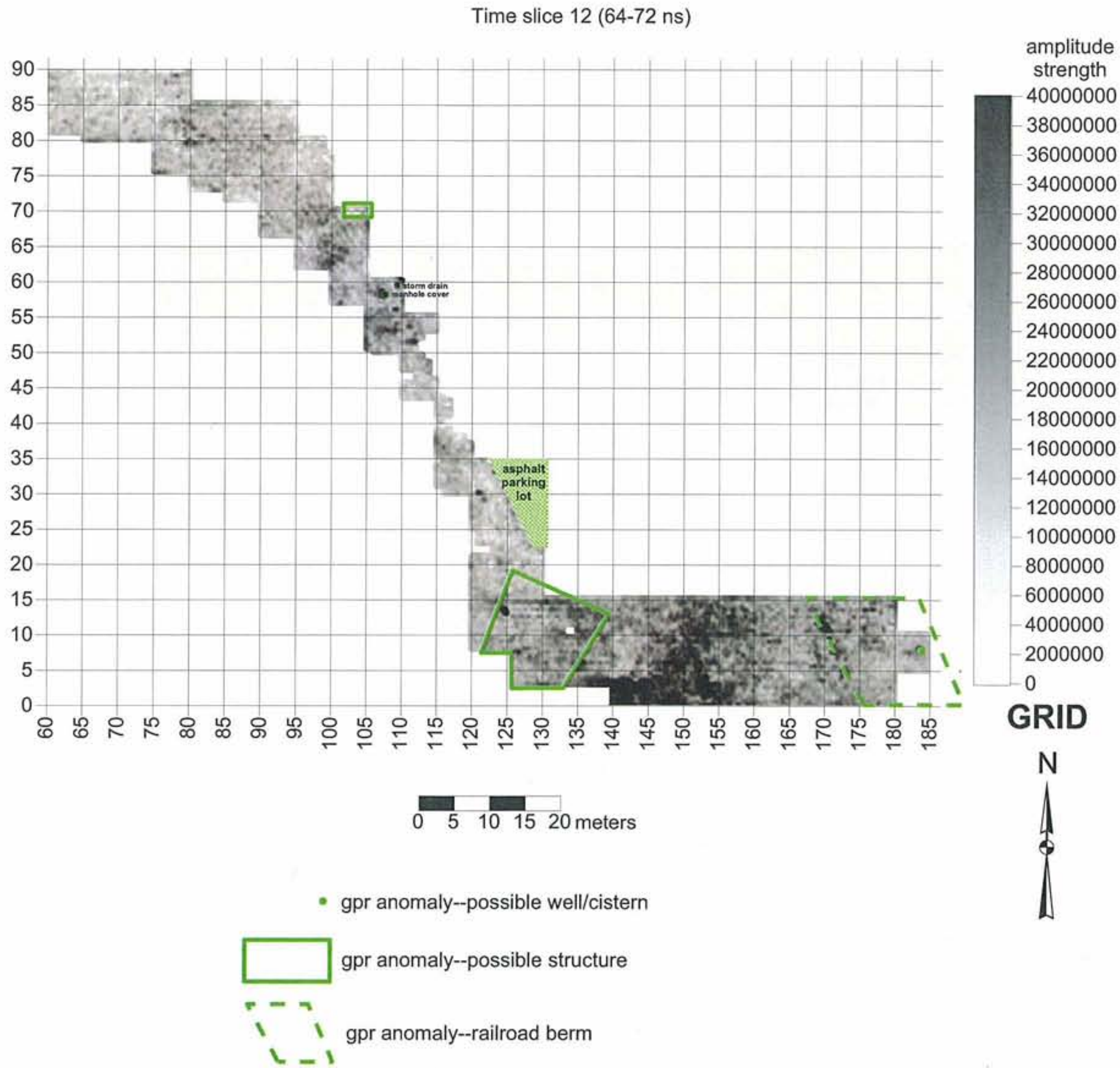

Figure 52. Interpretation of ground penetrating radar time slice 12 from the eastern portion of the south unit in VNHR Area #3.

9772

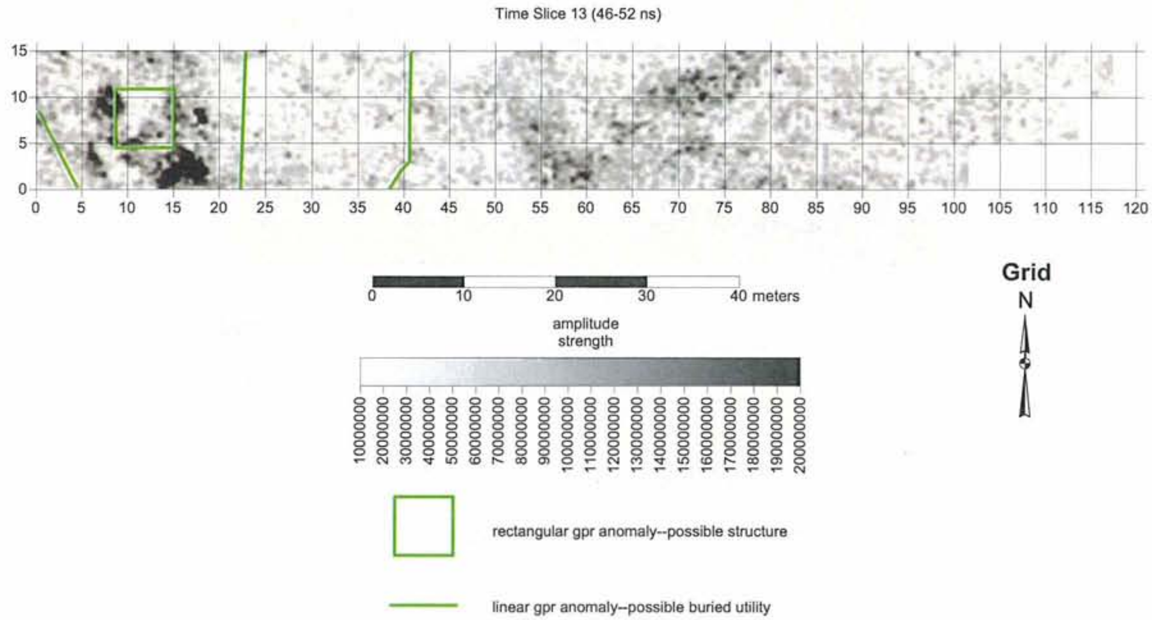

Figure 53. Interpretation of ground penetrating radar time slice 13 from VNHR Area #4.

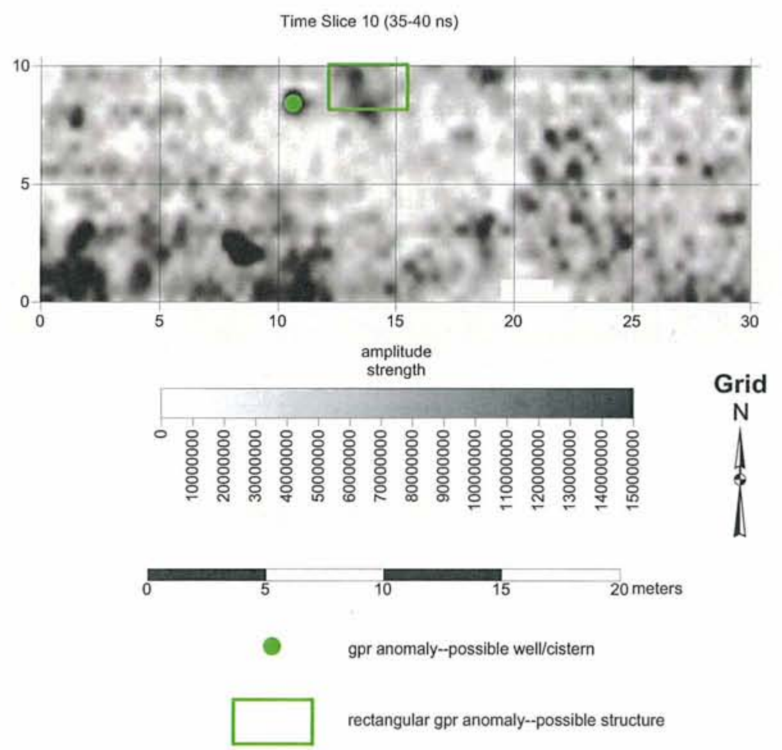

Figure 54. Interpretation of ground penetrating radar time slice 10 from the western portion of the north unit in VNHR Area #5.

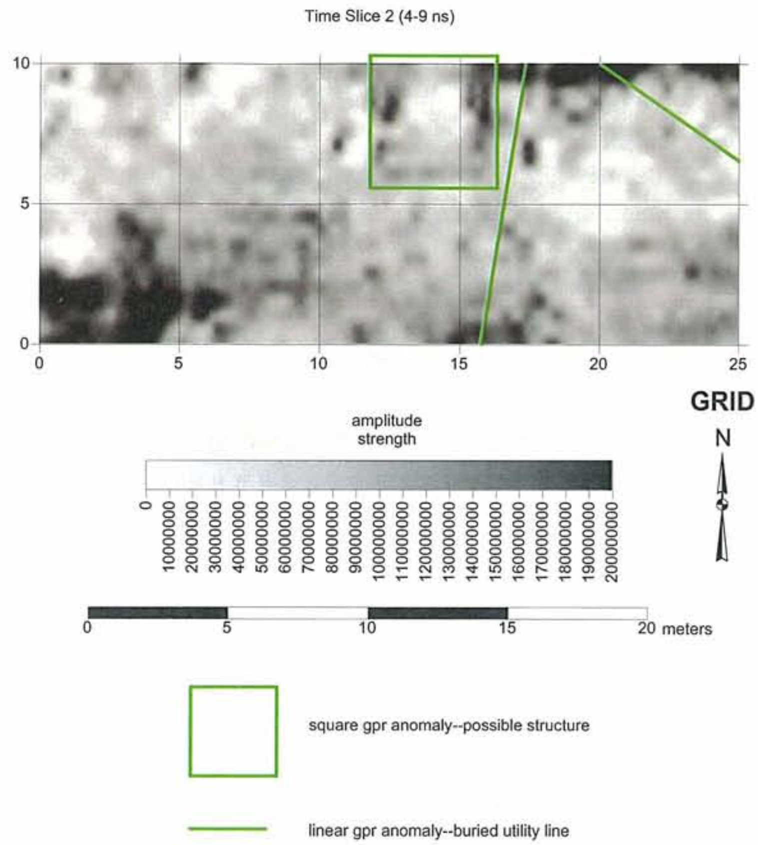

Figure 55. Interpretation of ground penetrating radar time slice 2 from the eastern portion of the north unit in VNHR Area #5.

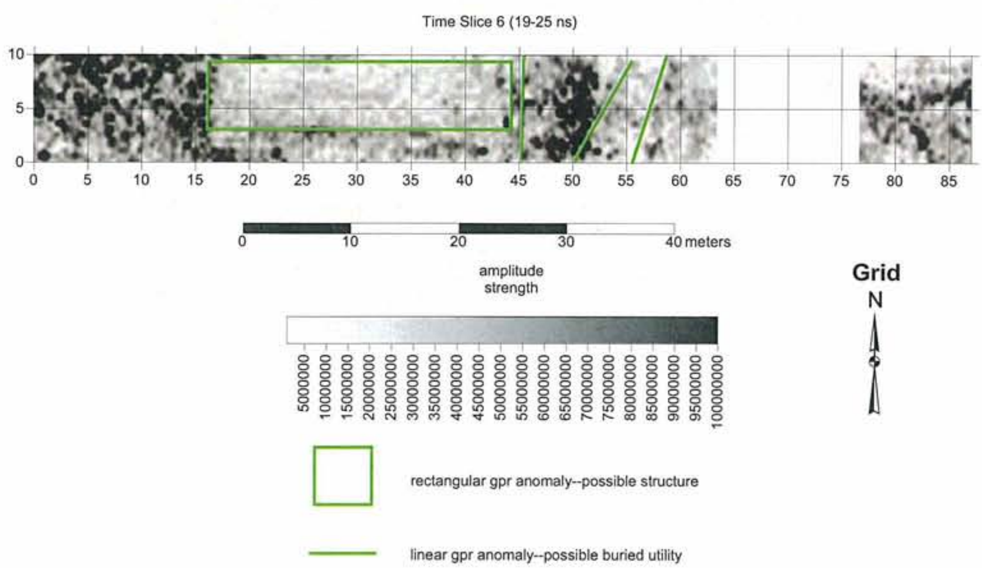

Figure 56. Interpretation of ground penetrating radar time slice 6 from the south unit in VNHR Area #5.

PRELIMINARY

A Magnetic Survey including portions of the Old Post Cemetery, Old Apple Tree Park, the HBC Village near the Land Bridge, and North of SE Columbia Road, Fort Vancouver National Historic Site, Vancouver, Washington

By:
Kendal McDonald, M.A.

February 17, 2009

Z-Too, Archaeogeophysical Prospection   Report No. 139

On January 29th, 2009, an archaeogeophysical survey was completed at four locations within the National Park Service, Fort Vancouver National Historic Site. The locations include a portion of the Old Post Cemetery north of East Evergreen Boulevard, a portion near the Hudson's Bay Company Village located north of Highway 14 and west of the Land Bridge, a section of Old Apple Tree Park, and a linear area of Waterfront Park located north of SE Columbia Way and south of the Burlington Northern Railroad tracks (Figure 1). The primary goal of the magnetic survey was to locate magnetic anomalies potentially related to historical occupation and establish locations for future archaeological shovel test probes.

Kendal McDonald conducted the survey under the direction of Leslie O'Rourke, M.A., an archaeologist for Fort Vancouver (FOVA) National Historic Site. FOVA archaeologists Jackie Cheung, Eric Gleason, and Heidi Pierson assisted with data collection.

Survey Methods

Magnetometers are extremely sensitive and can record very subtle changes in the magnetic content of sediments. Magnetic anomalies can be caused by natural or cultural sources. The disturbance in the natural background of the matrix can under some conditions produce a detectable magnetic signature, termed an "anomaly". The magnetic maps that are produced look similar to topographic maps, however, instead of displaying peaks and valleys in elevation the maps show positive magnetic polarity (highs) and negative magnetic polarity (lows) of the ambient magnetic field. Magnetic signatures are recorded in a unit of measure called a nanotesla (nT).

A Geometrics G-858 cesium magnetometer, configured as a gradiometer, was set at a cycle of 10 readings per second. The manufacture sensitivity at a 0.1 cycle rate is 90% of readings sensitive to 0.05 or 1/20th of a nT (nanotesla). All areas were surveyed using metric measurements. Guidelines were placed every meter (m), but data were recorded every 0.5 m. Fiduciary marks were entered into the data set at 5 m increments along each transect. Wooden stakes were left in place after the survey. The plans called for cartographer Keith Garnett to record the exact location of each of the survey areas.

Surfer for Windows, version 8.01 was used to generate the maps. Maps generated by data collected from one sensor can contain magnetic anomalies that are the result of solar weather. Data from both sensors were used to calculate the vertical gradient and create the maps. The vertical gradient data eliminated the influence of solar weather and therefore removed the risk that solar disturbance would be incorrectly identified as a buried archaeological artifact or feature. The chosen grid method that controlled how the data points were interpolated was minimum curvature. Finally, the map contour intervals chosen for the survey areas were subjectively selected to show the finest resolution yet not have the isolines so dense as to obscure all details of the anomalies. The larger or more distinct anomalies were numbered.

Magnetic data were collected on five survey areas in four locations. The survey areas were almost level with only very slight rises and depressions on the mowed lawn. There were overhead power lines observed and some obstacles, such as trees and shrubs. A small portion of a concrete sidewalk and a raised concrete parking curb cut through two corners of one survey area, but it was unknown if they contained reinforcing bars. Metal cyclone fences paralleled several of the survey areas. Sprinkler heads in a flowerbed of the Old Post Cemetery and plastic tubing near trees in Old Apple Tree Park were noticed.

It was expected that buried utility lines would produce magnetic anomalies. If the sidewalk and parking curb contained rebar, then the metal would likely generate a strong

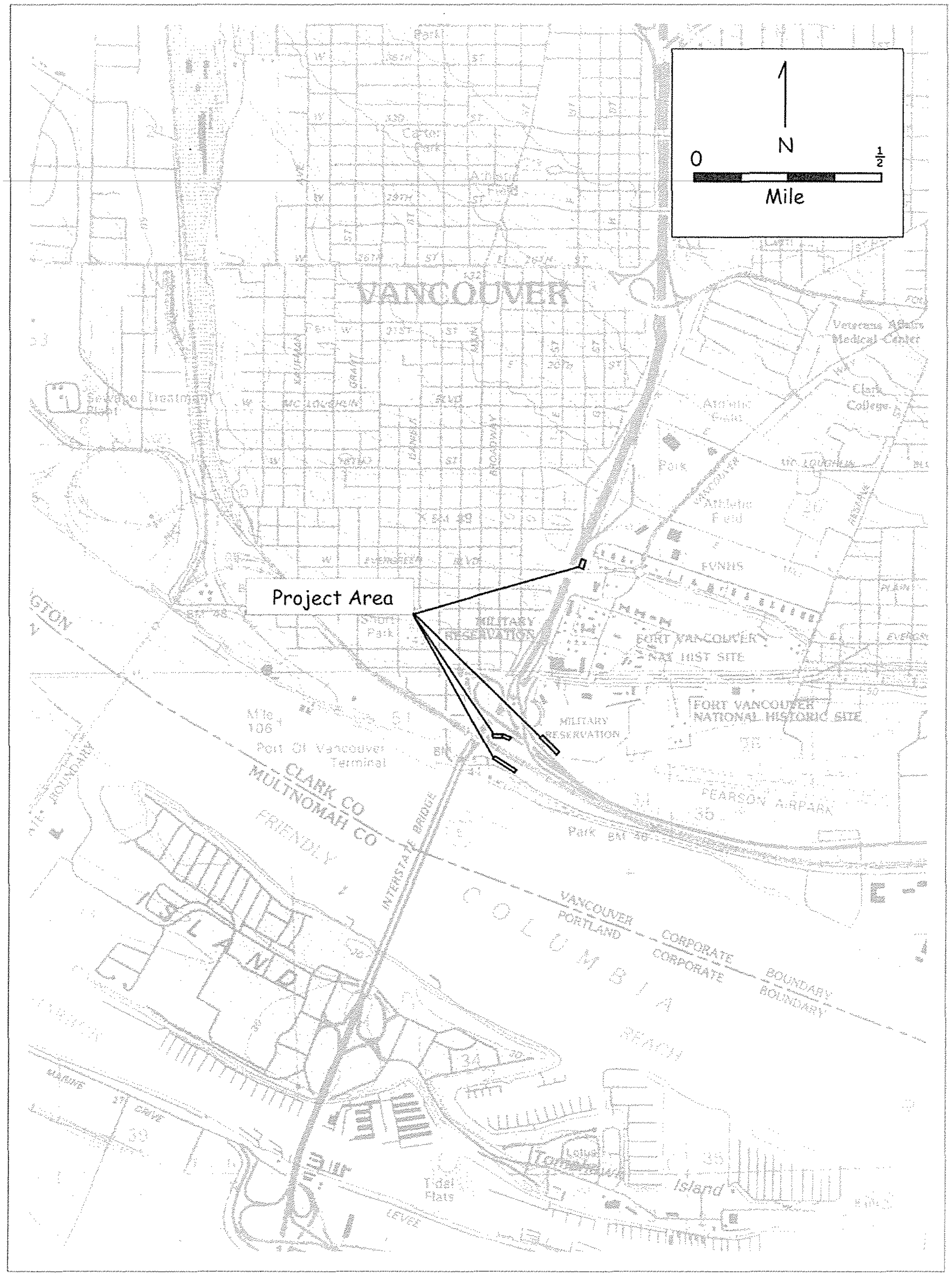

Figure 1. Location of project areas as depicted on the Vancouver, WA-OR 1990 and the 1990 Portland, OR-WA 7.5-minute USGS topographic quadrangles.

magnetic signature. The metal cyclone fences usually produce magnetic disturbances so the survey areas were set 1.5 to 2.0 meters away from them. Overhead power lines were considered too distant to produce anomalies.

Results

Contour maps of all five survey areas are presented. The contour map shows an overview of the more pronounced anomalies whose sources can often be explained by above ground metal objects and underground utility pipes. In general, all areas are fairly magnetically disturbed. Individual survey areas are presented below at contour intervals ranging from 10 to 100 nT.

Survey Area 1

Survey Area 1 was on a green lawn between a metal fence and concrete wall bordering Interstate 5 to the west and a driveway to a parking lot along the eastern border. The southern edge overlapped the sidewalk along East Evergreen Boulevard. This location is referred to as the Old Post Cemetery. As expected, the anomaly in the southeast corner is likely generated by the sidewalk and the anomaly in the northeast corner was generated by the raised concrete parking curb (Figure 3). One sprinkler head, noticed along the western edge of the survey area in a planting bed, did not produce a noticeable anomaly. Between the southern edge of the survey area and Anomaly 1 is a large magnetically disturbed area. The disturbance could represent a linear anomaly generated by buried utility lines or general disturbance from construction of the road and sidewalk. A metal sign post a meter east of the survey area and near the sidewalk is the likely cause of Anomaly 8. Anomalies 1 and 2 are farther from sidewalk and could indicate the location of anomalies generated by archaeological sources. Anomalies 3-6 are strong and could be generated by sources containing a higher concentration of magnetic material, such as iron, than that of the surrounding sediments. Anomaly 7 might generated by a linear source or could be several smaller sources that in the small survey area form a short alignment.

Figure 2. The photograph shows the southeast corner of Survey Area 1 near the center of the sidewalk in the foreground. A metal fence and concrete wall covered in ivy parallel the western border of Survey Area 1. The rope transect lines are placed at 1 m intervals. The view is to the west.

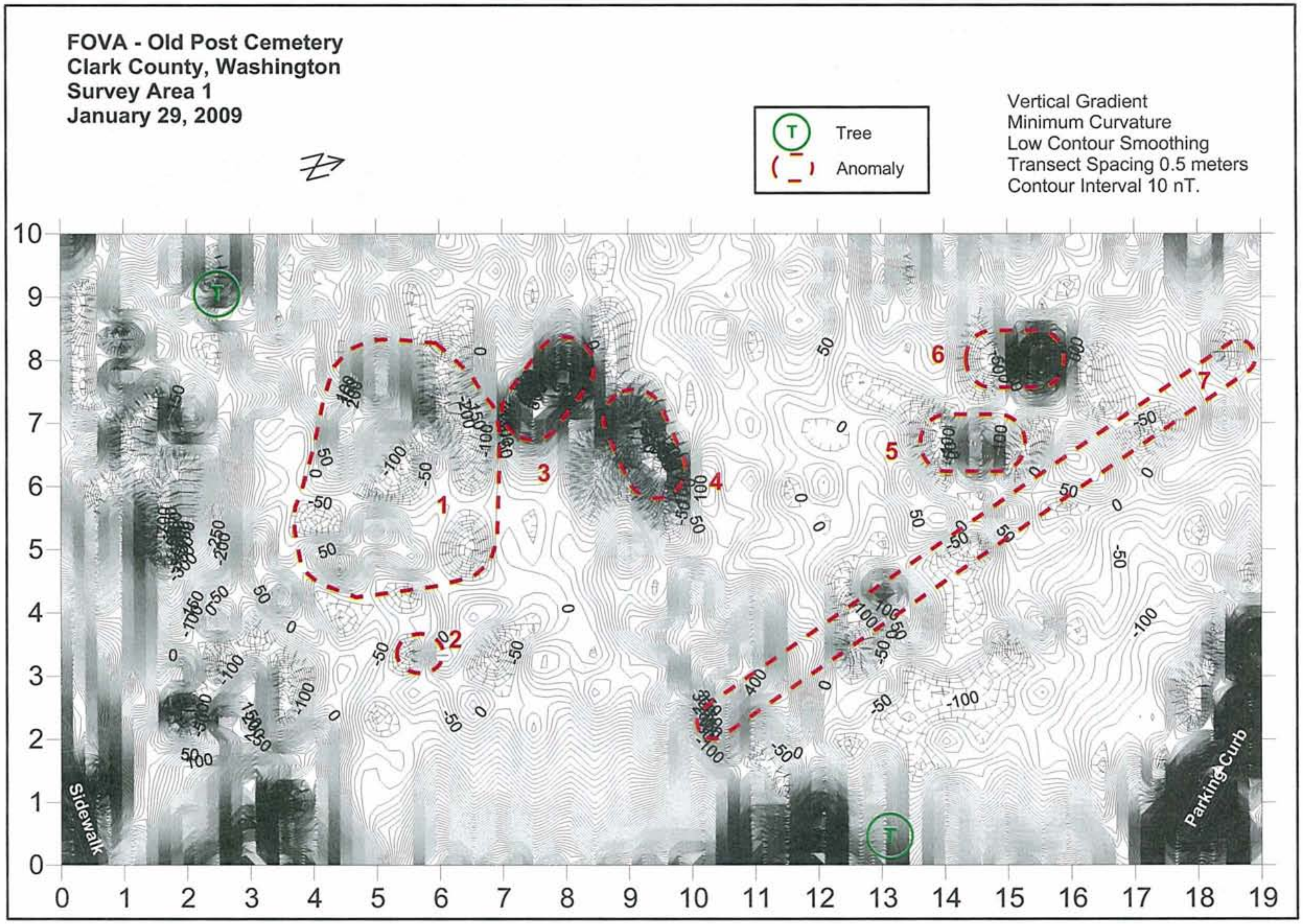

Figure 3. Contour map of Survey Area 1 at a 10 nT contour interval.

PRELIMINARY

Survey Area 2

Survey Area 2 was a 100 x 15 m area northwest of the Land Bridge. The survey area was offset 1.5 – 2.0 m from, but paralleled to a metal cyclone fence (Figure 4). There were no obstacles in the survey area. In one small section, ceramics were noticed in a mole dirt pile. The contour map contains two distinct sections of the 100 m long survey area (Figure 5). From east to west, the first fifty meters is shown at a coarse 100 nT contour interval and contained three linear anomalies crossing the field. The source of these anomalies is likely old roads, potentially once paved with material different than the surrounding sediments. Although only Anomaly 10 is clearly visible, and Anomaly 12 is masked by a stronger disturbance and might not actually exist, Anomalies 9-12 appear to be evenly spaced every 6 m. These four anomalies were circled as they continue westward in two rows appearing every 6 m, for the remaining 50 m of the survey area. These are likely generated by metal rebar left in place within old archaeological excavation units (Doug Wilson, personal communication 2009). This same spaced pattern was detected in an earlier magnetic survey within the Hudson's Bay Company Village (McDonald 2003). In the last 50 m of the survey area the evenly spaced anomalies were not circled and only the anomalies that did not fit the pattern were numbered. There is less magnetic disturbance in the second fifty meters so the contour interval was increased and set to 20 nT. The metal fence was slightly closer and thus the disturbance generated from it was more prevalent in the second fifty meters. Anomalies 13 – 21 were all small and likely contained iron or other magnetic metals. Anomaly 18 could be generated by two or more sources in close proximity to one another. All sources of magnetic disturbance are likely buried less than 1 m in depth.

Figure 4. Photograph of the southeastern corner stake near the landscaped berm of the Land Bridge and the southern boundary of Survey Area 2.

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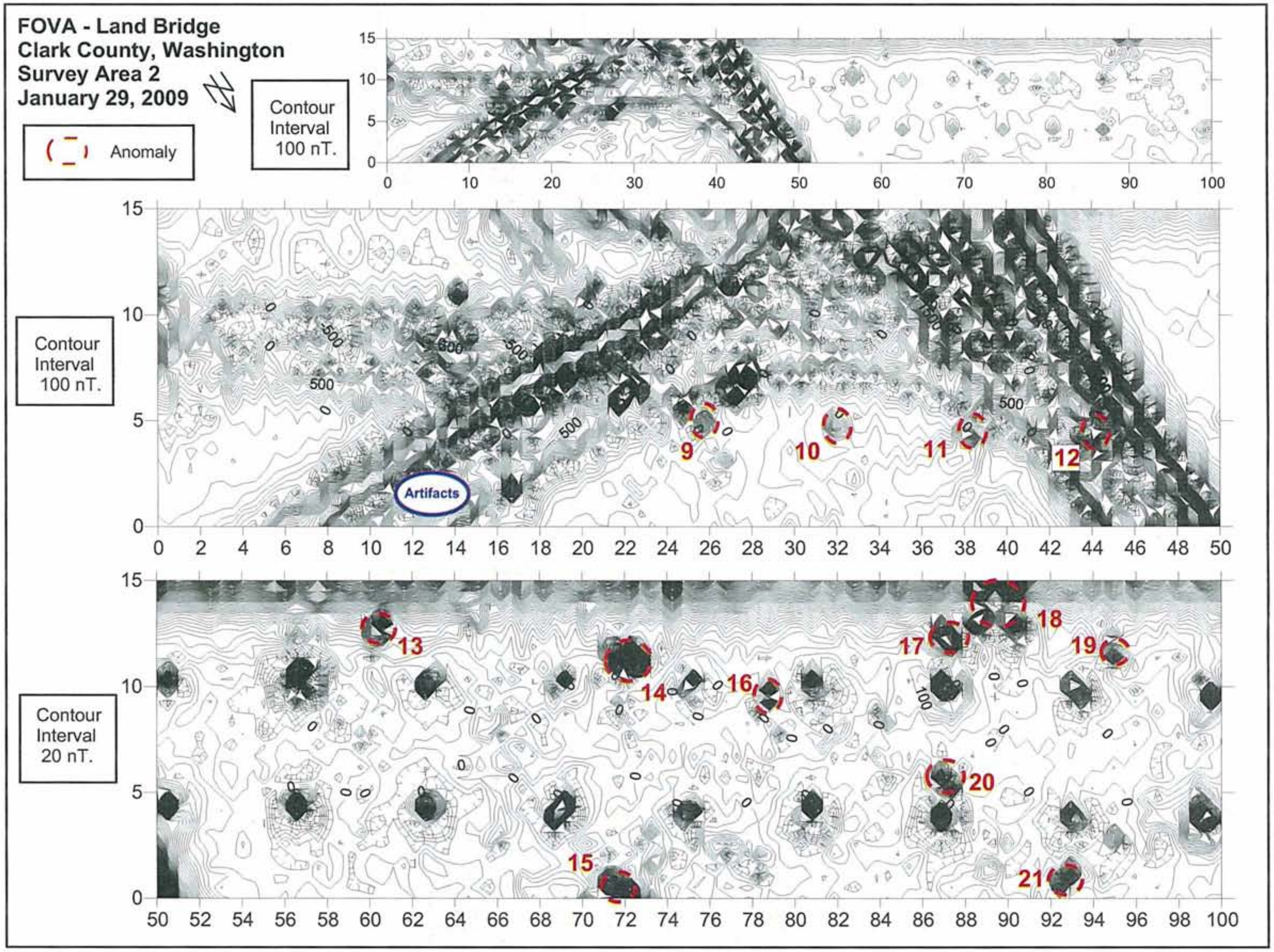

Figure 5. The contour map of Survey Area 2 shows linear anomalies and uniformally spaced anomalies.

PRELIMINARY

Survey Areas 3 and 4

Survey Areas 3 and 4 were located on a bend toward the northwestern end of Old Apple Tree Park (Figure 6a). There were numerous trees and several stumps in the survey area. Plastic watering tubes were visible near trees and stumps (Figure 6b). The northern edge of Survey Area 3 showed magnetic disturbance from the nearby metal cyclone fence (Figure 7). When presented at a 10 nT contour interval the area appeared fairly magnetically disturbed. The disturbance along the northern edge is likely due to proximity to the metal cyclone fence. Based on strength and shape, Anomalies 22 and 23 had the highest potential of being generated by buried artifacts. The remainder of the survey area could be naturally disturbed or caused by trenching for the plastic watering tubes. The overall magnetic disturbance continued in Survey Area 4 (Figure 8). Survey Area 4 is presented at a coarser 20 nT contour interval. Again, two anomalies, (24 and 25), had the highest potential of being generated by buried artifacts. Linear Anomalies 26 and 27 are more likely generated by subsurface utility lines or from sediment disturbance in their trenches

Figure 6. a) The photograph shows the southwestern corner stake of Survey Area 4 in the foreground. The wooden stake in the middle distance is the southeastern corner of Survey Area 3. b) Black plastic tubing was visible near each tree in the survey area.

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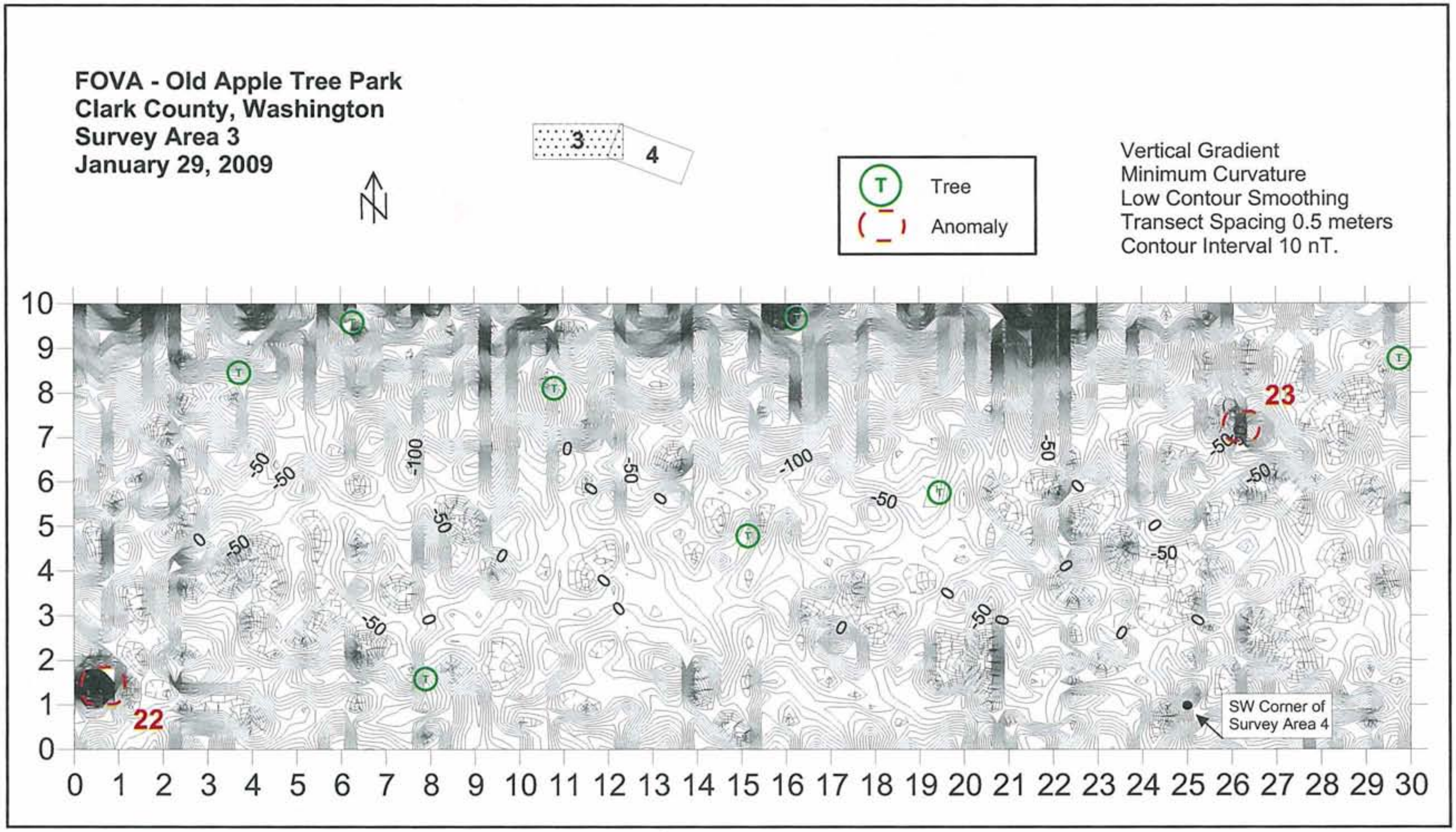

Figure 7. A contour map of Survey Area 3 is presented at a 10 nT contour interval.

PRELIMINARY

9783

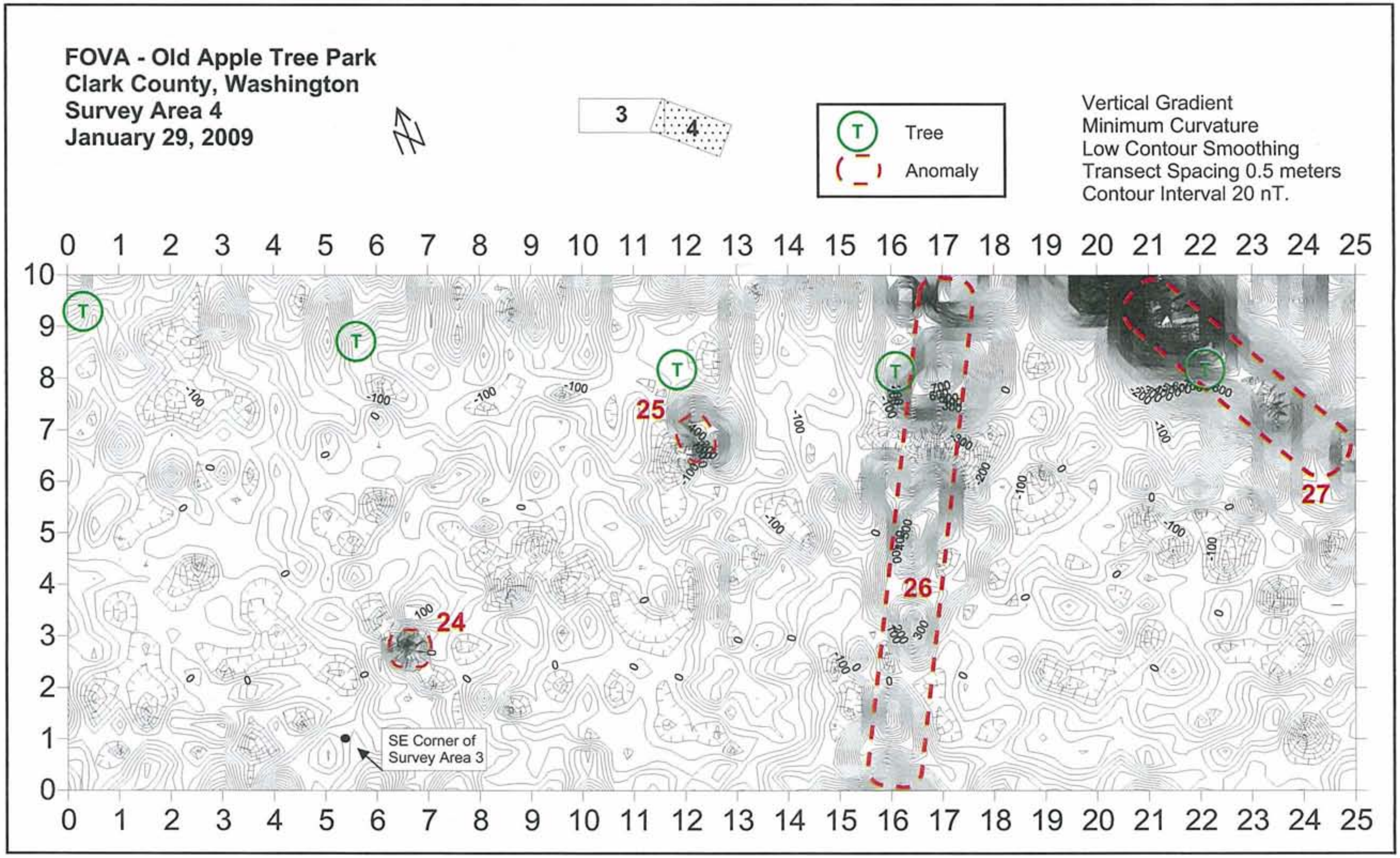

Figure 8. A contour map of Survey Area 4 is presented at a 20 nT contour interval.

PRELIMINARY

Survey Area 5

Survey Area 5 was located along SE Columbia Way (Figure 9). The majority of the area surveyed was to the west of the concrete walkway entrance to Old Apple Tree Park. No data was collected over the concrete walkway into the park, but the survey continued east of the walkway (Figure 10). A utility line crossed above part of the survey area, but was expected to be too distant to produce a magnetic anomaly. No metal debris was visible on the surface within the survey area.

As expected, the overhead utility line did not generate a detectable anomaly when the data were presented at a coarse 25 nT contour interval (Figure 11). Anomaly 28 was likely generated by the metal signpost visible in Figure 9 near the green bag and white bucket, but outside the survey area. Anomalies 36 and 38 are linear could be generated by utility lines. Anomaly 38 is several meters from the walkway and might also be generated by debris from the construction of the path or rebar in the concrete. Anomaly 34 might be generated by a linear feature or could be generated by several individual sources in alignment. Based on its polarity, Anomaly 31 could be generated by one or more sources. The anomalies closer to the road (e.g. Anomalies 29, 30, and 41) have a higher likelihood of being generated by metal debris from road construction or maintenance. Anomalies 41, 42, and 43 are similar in size and shape and could be generated by similar sources. The smaller diameter anomalies are likely generated by near surface artifacts containing magnetic metal, such as iron.

Figure 9. The photograph shows the southwestern corner stake of Survey Area 5a in the foreground.

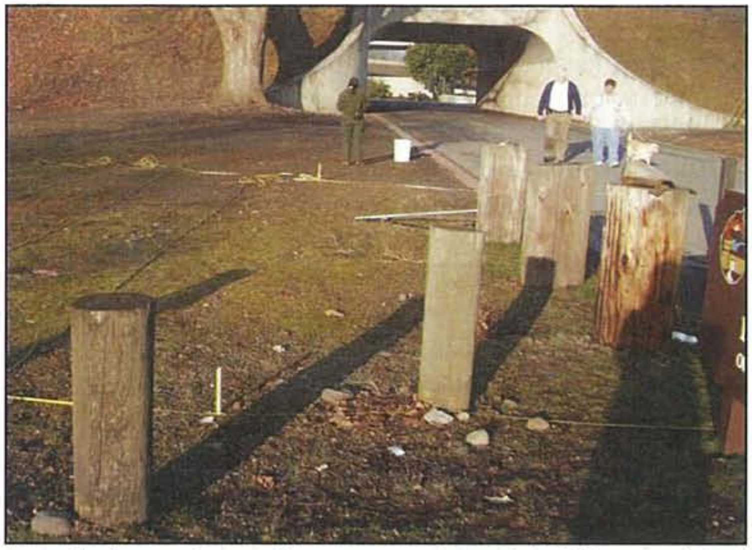

Figure 10. The photograph shows the southeastern corner stake of Survey Area 5a in the foreground and the northeastern corner stake in the background. The survey continued for 9 m east of the walkway.

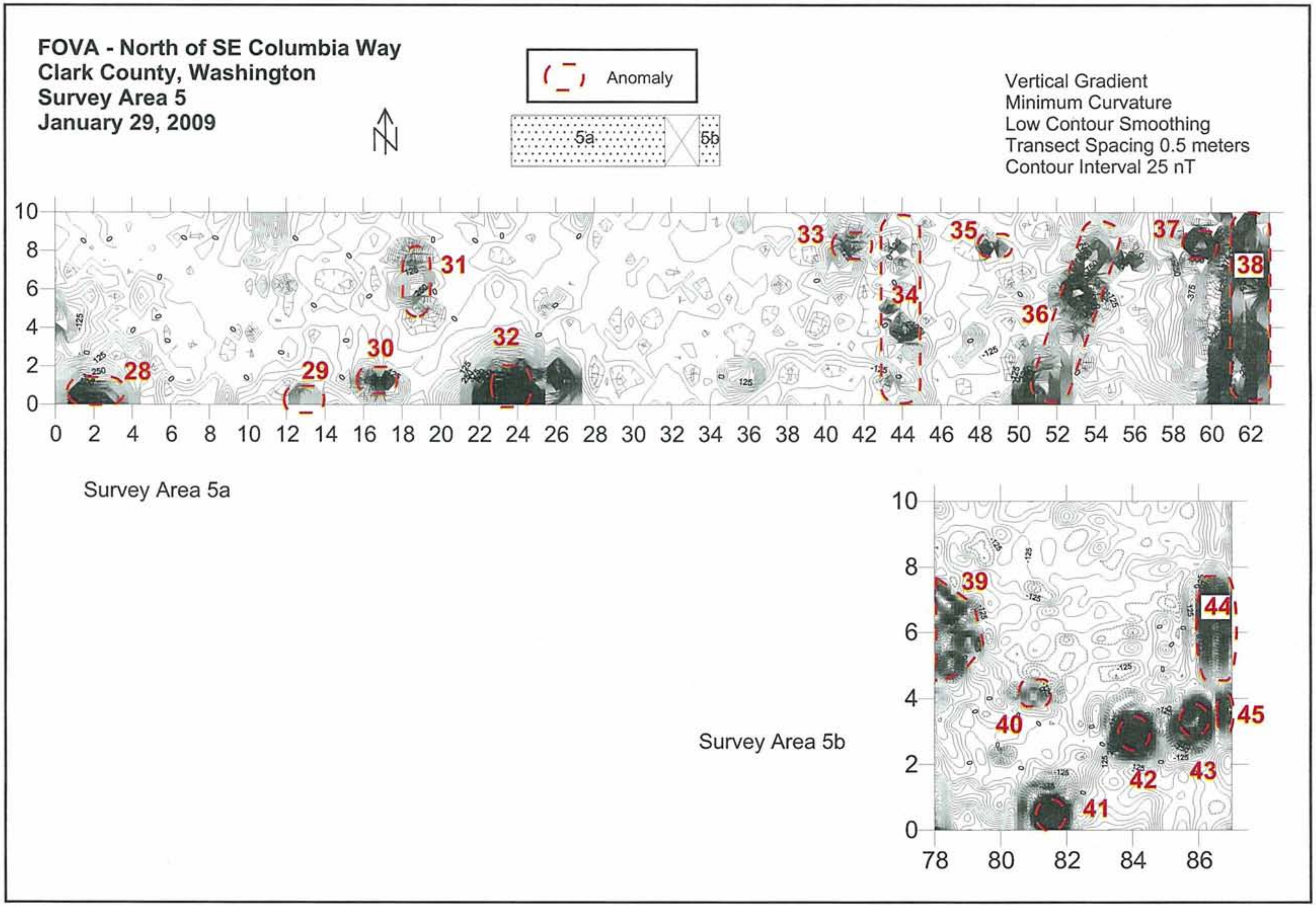

Figure 11. A contour map of Survey Area 5 is presented at a 25 nT contour interval.

PRELIMINARY

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Discussion and Summary

A magnetic survey performed at Fort Vancouver National Historic Site located many magnetic anomalies. Four locations were surveyed, including a portion of the Old Post Cemetery north of East Evergreen Boulevard, a portion near the Hudson's Bay Company Village located north of Highway 14 and west of the Land Bridge, a section of Old Apple Tree Park, and a linear area of Waterfront Park located north of SE Columbia Way and south of the Burlington Northern Railroad tracks. Some of the magnetic signals were generated by visible above ground sources, such as metal posts. Other magnetic anomalies were likely generated by subsurface features such as utility lines. However, for the majority of the magnetic anomalies, the sources were unknown. Some of the anomalies could be generated by natural variations in the local sediments. Other anomalies might be related to earlier occupation in the area. The primary goal of the magnetic survey was to locate magnetic anomalies related to historical occupation and establish locations for future archaeological shovel test probes.

Linear anomalies such as Anomaly 7, Survey Area 1, Anomalies 26 and 27, Survey Area 4, and Anomalies 36 and 38 in Survey Area 5 might be generated by underground utility lines. There were also linear anomalies that covered most of the eastern half of Survey Area 2 and are likely generated from old road surfaces.

Anomalies more pertinent to this study are those that encompass areas of disturbance that could be related to earlier occupation of the area, such as Anomalies 1 and 3-6, Survey Area 1, Anomalies 13-21, Survey Area 2, Anomalies 22-23, Survey Area 3, Anomaly 24-25, Survey Area 4, and Anomalies 31, 33, and 40 in Survey Area 5.

In Survey Area 5, large anomalies that appear to have a single source include Anomalies 32, and 41-43. These anomalies are similar in size, shape, and strength and it is possible that they are all generated by the same type source.

There are areas that are less magnetically disturbed within the survey areas and these areas are less likely to contain historical features and artifacts.

The survey successfully detected many magnetic anomalies that could be generated by historical artifacts and features. The sources of some of the magnetic anomalies are known and others are speculative. Only ground truthing can determine the source of the magnetic anomalies. The magnetic results from this survey provide a better understanding of the subsurface features and artifacts at Fort Vancouver National Historic Site and can assist in the placement of future excavation units and preservation of the site.

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1990 *Portland, OR-WA 7.5-minute topographic quadrangle map.* Copy of map on file at Applied Archaeological Research, Inc., Portland, Oregon.

STACKED TRANSIT HIGHWAY BRIDGE

Section 5309 New Starts

September 4, 2008

Columbia River CROSSING

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.

Americans with Disabilities Act (ADA) Information

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

¿Habla usted español? La informacion en esta publicación se puede traducir para usted. Para solicitar los servicios de traducción favor de llamar al (503) 731-3490.

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ACRONYMS

CRC	Columbia River Crossing
CRD	Columbia River Datum
DEIS	Draft Environmental Impact Statement
FAA	Federal Aviation Administration
IWWW	in water work window
LRT	light rail transit
MUP	multi-use path
STHB	Stacked Transit Highway Bridge

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1. Overview

The Columbia River Crossing (CRC) Project is proposing to replace the functionally obsolete and seismically deficient Interstate Bridges that carry Interstate 5 (I-5) across the Columbia River. The Columbia River Crossing Project will extend light rail transit from the existing Expo Center Station in north Portland, Oregon, where the Yellow MAX line currently terminates, to downtown Vancouver, Washington. In the Draft Environmental Impact Statement (DEIS) phase of the CRC Project, numerous river crossing alternatives were studied, including an option that would use separate bridges for the northbound and southbound I-5 traffic and a third bridge to carry light rail transit (LRT) and a multi-use path (MUP). Another option studied to extend transit across the Columbia River was via a Stacked Transit/Highway Bridge (STHB). Though the Type, Size, & Location still must be finalized, the STHB design is in the focus of design for this Section 5309 New Starts Report.

The STHB provides for a shared highway, transit, bicycle, and pedestrian facility as shown on Figure 1-1. The LRT guideway would be placed in the lower level of the bridge, perhaps inside the concrete segmental box girder of the southbound I-5 Columbia River Bridge and the MUP under the overhang of the bridge, eliminating the need for a third bridge

The STHB design is an adaptation of the segmental concrete box bridge design that has been widely used since it was introduced in the 1950s. This approach, while infrequently used, does have some precedence. Notable examples include the Nuselsky Bridge in Prague (Figure 1-2) and the Reichsbrucke Bridge in Vienna, Austria (Figure 1-3). On the Reichsbrucke Bridge, pedestrians and cyclists are provided a pathway on a lower level facility, similar to what is proposed for the CRC Project.

The project still must complete a Type, Size, and Location study with oversight from the Federal Highway Administration and the Federal Transit Administration.

Figure 1-1. Stacked Transit Highway Bridge Cross Section

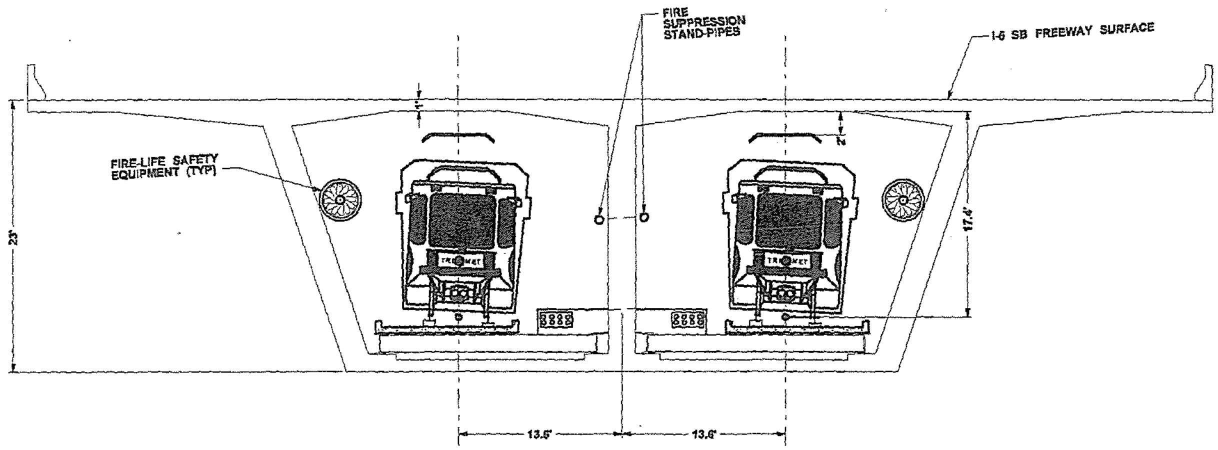
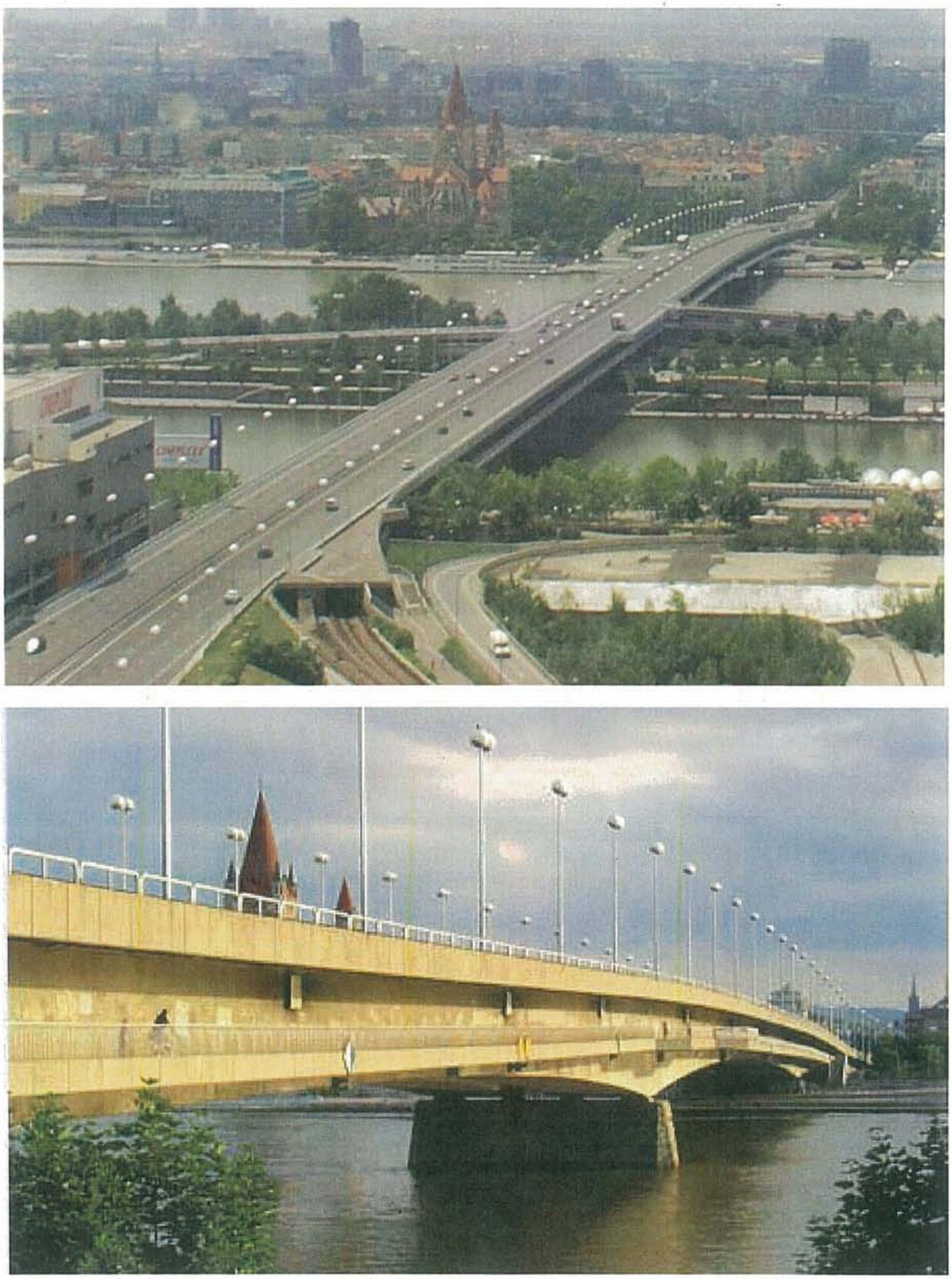


Figure 1-2. Nuselsky Bridge (Prague)

Figure 1-3. Reichsbrucke Bridge (Vienna)



2. Stacked Transit / Highway Bridge

The CRC Project Team has performed a preliminary analysis of the STHB design. This analysis included an investigation of aviation and navigation constraints, life safety requirements, and effects on the Columbia River, transit operations, construction schedule, and costs. Preliminary analysis has shown that the STHB has similar effects to aviation and navigation constraints, when compared to a three-bridge alternative. The STHB does, however, need to address life safety more directly than some other designs. Advantages of the STHB include fewer piers in the Columbia River, a smaller overall footprint over the Columbia River, decreased construction time, and likely reduced construction cost.

2.1 Aviation and Navigation Constraints

The location and type of a new Columbia River bridge is constrained by navigation requirements on the Columbia River and airspace restrictions from nearby Pearson Field. A bridge must be high enough to accommodate river traffic and low enough not to obstruct aviation operations at Pearson Field and Portland International Airport. For the STHB, the profile of I-5 must be raised from the three-bridge alternative approximately five feet at the north shore of the Columbia River in order to maintain adequate clearance over the BNSF railroad tracks. This raise also maintains a vertical clearance of 95 feet above an elevation of 0 on the Columbia River Datum over a width of 300 feet, which is required for marine navigation. In addition, the five-foot raise in profile will not create a conflict with the Pearson Field's critical Federal Aviation Administration (FAA) mandated Part 77 imaginary surfaces. Despite the five-foot raise in profile, there is very little difference in impact of STHB and three-bridge options with respect to the aviation and navigation constraints.

2.2 Life Safety

As shown in Figure 1-1, the enclosed environment inside the STHB structure has many similarities to a tunnel, and life safety requirements will also be similar. These requirements would include a standpipe fire suppression system, emergency lighting, ventilation, fire detection system, and full-time surveillance equipment. Such features are common in transit tunnels located in the region and elsewhere in the United States. Inherent features of the proposed STHB, such as the location and occupancy of the structure, elevate the project threat and risk profile. These threat and risk profiles for the proposed structure may require development of counter-terrorism design procedures and features. These considerations would change if the final bridge design incorporates a more open structure than a fully-enclosed concrete box.

2.3 River Impacts

The STHB will eliminate one bridge and reduce the number of piers located in the Columbia River by about 25 percent (from 21 piers on the three-bridge option to 17 for STHB). It should be noted that while there are fewer foundations for the STHB, each individual foundation could potentially be larger than those required for structures in the three-bridge option. Overall thought, preliminary analysis shows that the STHB will result in a decrease in total foundation footprint of approximately 20% when compared to the three-bridge alternative. A smaller overall foundation footprint and fewer piles will result in less in-water work and a reduced environmental impact.

The STHB concept reduces the total number of structures crossing the Columbia River from three to two, resulting in several benefits. The total reduced width of structures will be less visually intrusive and would reduce the number of structures and pile caps through which vessels must navigate. Additionally, the reduced right-of-way requirements would open up more shoreline for public use or development.

2.4 Construction Time

Construction time in the river will be shorter for the STHB than if LRT was constructed on a separate bridge because the STHB only requires two structures. Table 2-1 shows approximate construction times resulting from initial analyses, including demolition of the existing Interstate Bridges. The STHB option has distinct schedule advantages over the three-bridge option for both the 12-month and 8-month in-water work windows (IWWW) and a slight advantage for the 4-month IWWW. The reduction in the number of foundations, as discussed above, is one of the major contributors to the reduced construction time.

Table 2-1 Preliminary Construction Schedules

In Water Work Window	Three Bridge	STHB	STHB Benefit
12-month	5.2 years	4.3 years	0.9 years
8-month	5.9 years	4.8 years	1.1 years
4-month	6.5 years	6.1 years	0.4 years

2.5 Transit

The profile of the LRT in the STHB is significantly lower than required in the three-bridge alternative. This lower profile allows the LRT to touch down in downtown Vancouver farther south (closer to the River) than would be possible with a three-bridge alternative. The three-bridge alternative would not allow touchdown to be located any further south than 6th Street. With the lower elevation of the stacked transit highway design, a transit station can be located at 5th Street, making the Vancouver waterfront more accessible, and the structure less visually intrusive from downtown Vancouver.

2.6 Cost

Initial cost estimates have indicated that capital expenditures for the river crossing including the STHB structure can be reduced by approximately ten percent when compared to the three-bridge option. The potential savings were determined from a quantity-based analysis for the main river crossing structure. Other major factors in determining the cost estimate, such as risk and schedule, were also taken into account to the extent possible at this stage in design.

3. Summary

The STHB has significant environmental benefits, requiring less in-water work, a smaller footprint, reduced shoreline impacts, reduced capital costs, and reduced construction time. The geometry allows for the earlier, less visually intrusive access to downtown Vancouver and a lower capital cost than the three-bridge option. Analysis has shown that the impacts to aviation at Pearson Field and navigation on the Columbia River for the STHB option are similar to the three-bridge option. The STHB, however will require additional life safety features, not required for the three-bridge option. The STHB would serve as an example for future projects on how to extend current bridge technology into a multimodal solution for new bridges in urban areas.

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E. D. Hovee
& Company, LLC
Economic and Development Services

MEMORANDUM

To:	David Unsworth, Jillian Detweiler – TriMet
From:	Tess Jordan, Eric Hovee
Subject:	Portland Light Rail Transit Land Development Experience & Application
Date:	July 28, 2008

Having opened its first light rail line in 1986, the Portland region now has a significant track record from which to draw observations concerning light rail's economic development impacts. Tracking of development by TriMet indicates that a cumulative total of more than $6 billion of development has occurred in light rail station areas along MAX corridors.

While there have been numerous studies in Portland and nationally investigating the linkage between light rail investment and land development, much of this has been focused on documenting increases in property value. Less empirical research to date has addressed how light rail impacts the character of development.

The analysis presented in this memorandum represents an initial effort to provide quantitative documentation of this phenomenon. This report first considers how development patterns changed after light rail was introduced on the *Blue Line* running from Gresham west to downtown Portland and then continuing to Hillsboro.

For this analysis, comparisons are made between development within a one-quarter mile radius circling each light rail transit (LRT) station and development occurring within a broader corridor extending one mile on either side of the LRT alignment. Results of the MAX Blue Line experience are then applied to development characteristics observed to station areas within the proposed Portland- Milwaukie light rail extension to illustrate development that may be realized within planned station areas for this planned new alignment.

This memorandum report is organized to cover the following topics:

Summary of Findings
Research Purpose & Approach
Blue Line Analysis
Milwaukie Line Implications
Detailed Research Methodology

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SUMMARY OF RESEARCH FINDINGS

The primary findings of this preliminary assessment of LRT development experience and application are summarized as follows:

1. For MAX Blue Line light rail transit station areas, development that occurred after light rail investment indicates an average development density or Floor Area Ratio (FAR) of 0.65 *more than* the average FAR experienced for development outside of station areas. *Note:* This means that for every 1,000 square feet of land area, station area taxlots that developed realized an additional 650 square feet of building area beyond the square footage realized in taxlots that developed outside of station areas.
2. The station area capture rate of corridor-wide condominium development increased from 14% to 56% after light rail investment was realized.
3. The rate of development within Blue Line station areas was 69% higher than elsewhere within a one-mile corridor extending along the LRT alignment. Rate of development was calculated as average annual square feet developed after light rail investment divided by existing building stock (in square feet) prior to light rail investment.
4. Vacant land availability does not appear to significantly affect the differences in development noted within and outside of station areas: as of 2007, significant vacant land remained in all geographies (29% of land area within station areas and 21% outside of station areas).
5. Low and moderate value lots within Blue Line station areas redeveloped at twice the redevelopment rate reported for low value lots outside of station areas.

When these results are used to illustrate potential development trends within station areas for the planned Milwaukie alignment, the result is an estimated 18.7 million square feet of projected development. Close to 5 million square feet of this development (or 27%) can be associated with the influence of light rail investment.

Other factors that influence land development within station areas and elsewhere along LRT alignments are described in the body of this memorandum.

RESEARCH PURPOSE & APPROACH

This preliminary research memorandum documents the development realized within two comparison geographies, before and after Portland's light rail transit (LRT) Blue Line was introduced. The geographies are 1) station areas, defined as taxlots within a ¼ mile radius of a light rail station, and 2) non station areas, or all taxlots within a two mile corridor encompassing the Blue Line (excluding station area taxlots). Within these two geographies, the following five variables were quantified:

1. Development density;
2. Percent of condominiums built within station areas (as a percent of total condominiums built within the wider comparison LRT corridor study area geographies);

3. Rate of development as a percentage of existing pre-LRT development (or building stock);
4. Vacant land (as a percentage of total land area) pre and post light rail development; and
5. Rate of land development as a percentage of initial low value land acreage.

This experience is then applied to planned Milwaukie light rail extension station areas. This is an *illustrative exercise* that estimates the development that may be realized within planned station areas within 20 years of light rail implementation – assuming market and other factors similar to those experienced along the existing Blue Line.

This documentation of development realized within Blue Line station areas does not assert causality. Three primary variables affecting development are the focus of this assessment: light rail implementation, proximity to a light rail station and land value.

Land development can also be expected to respond to other variables. These may include factors such as location, access, land configuration, economic cycles, and public sector involvement or incentives. However, in the absence of a more extensive hedonic or regression analysis (which aims to determine the statistical significance of influence of multiple influences), the approach taken with this report is intended to contribute to a better initial understanding of the realized interaction between light rail implementation and urban land development.

Portland's Blue Line is roughly 33 miles long, connecting to Gresham and Hillsboro as the respective eastern and western communities of the metro region. In total, this LRT line extends across 56 stations in suburban, central city and town center environments. The Portland to Gresham portion of the line was completed first (in 1986), followed by the Portland to Hillsboro extension (in 1998).

Taken together, the Blue Line LRT station areas (totaling roughly 3,000 acres) and their comparison 1-mile corridor geographies (roughly 26,800 acres) provide a high degree of variation in terms of the factors that influence real estate development. This post-development analysis is further enhanced by the length of the combined alignment and the 9-21 years since light rail's introduction.

The analysis methodology corresponds with similar research of the transit-development nexus conducted first conducted in 2005 for Portland Streetcar but limited to the Central City portion of the metro area.

BLUE LINE RESEARCH ANALYSIS

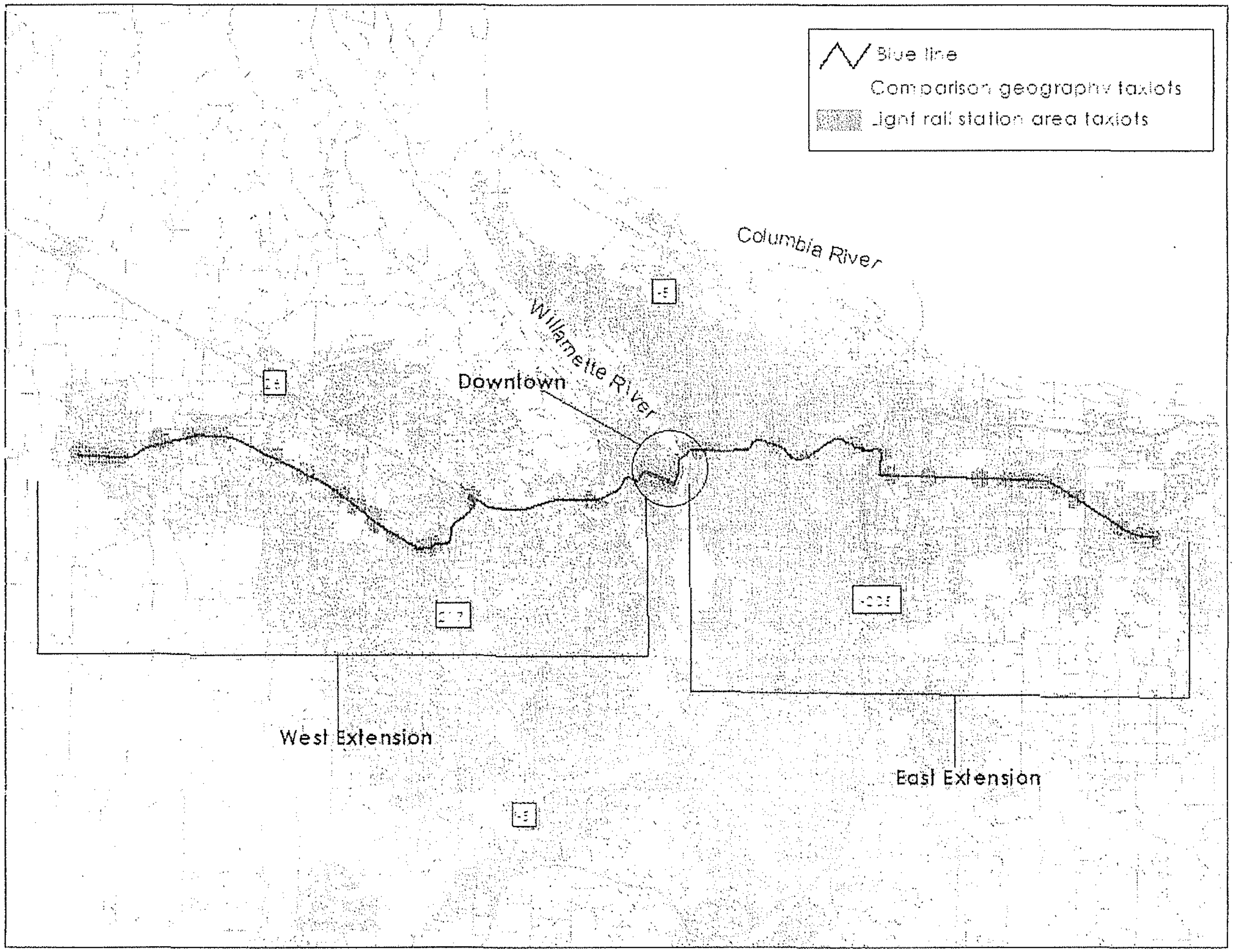
For purposes of this research project, the MAX Blue Line extending from Gresham (on the east) to Hillsboro (west of Portland) was divided into three segments for analysis:

- The *east extension* was completed in 1986 and extends from Gresham west to Portland's Central Eastside, a subdistrict within its Central City. Taxlots within the east extension geography total approximately 13,500 acres (within one mile on each side of the alignment).
- The *downtown geography* encompasses Portland's Central Business District, defined by the Willamette River (to the east) and I-405 (to the west). This is the highest density geography under consideration. The Blue Line extended to the western boundary of this geography in its first phase completed in 1986.

  This is the most complex geography, particularly as the only area that is also affected by other fixed rail transit (streetcar was first introduced in 1999 and runs north-south through the Central Business District and beyond). At around 500 acres for the study area considered, downtown is also significantly smaller than the suburban geographies.
- The *west extension* was completed in 1998, and connects downtown Portland with the Westside cities of Beaverton and Hillsboro. Like the east extension, this segment of the Blue Line runs through more suburban environments as well as non-CBD town centers. Taxlots within the west extension geography total approximately 15,600 acres.

Due to the distinctive character exhibited by each of these three geographies, research results are reported for each separately as well as for the Blue Line alignment in total. Results are reported in terms of *density of development* and also *rate of development*.

Figure 1. Blue Line MAX Corridor Overview



Source: RLIS, E.D. Hovee & Company, LLC.

1. Density of Development

The first variable considered addresses the character of development in proximity to LRT. With this research project development density has been calculated in term of Floor Area Ratio (FAR), the ratio of building square feet to land area. To illustrate this concept, FAR of 1.0 equates to a single story building that covers a lot in its entirety, or a two story building that covers 50% of the lot.

LRT and Increased Development Density. Light rail introduction was found to correlate with increased development density within station areas. In total, the average FAR of development within station areas after the introduction of light rail was 1.18, more than double the FAR of non station areas lots developed within the same time period (0.54).

Table 1. MAX Blue Line Development Densities (Pre- and Post-Light Rail)

	Average Realized FAR	Station Area Premium	Condo Units	Station Area Condo Capture
		Total Alignment		
Post Light Rail				
Station Area	1.18	0.65	2,594	56%
Non Station Area	0.54		4,603	
Pre Light Rail				
Station Area	0.64	0.38	1,052	14%
Non Station Area	0.26		7,541	
		East		
Post Light Rail	0.74	0.30	515	48%
Station Area	0.43		547	
Non Station Area				
Pre Light Rail	0.36	0.09	140	6%
Station Area	0.27		2,398	
Non Station Area				
		Downtown		
Post Light Rail				
Station Area	11.06	7.20	346	13%
Non Station Area	3.86		2,735	
Pre Light Rail				
Station Area	4.18	2.02	153	8%
Non Station Area	2.16		1,853	
		West		
Post Light Rail				
Station Area	0.88	0.47	1,733	57%
Non Station Area	0.41		1,321	
Pre Light Rail				
Station Area	0.43	0.24	759	19%
Non Station Area	0.20		3,290	

Source: RLIS, E.D. Hovee & Company, LLC.

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The FAR variable describes taxlots that developed within the time period in question only, rather than for the landscape as a whole. The FAR variable is therefore independent of the vacant land variable: a geography can have significant vacant land and still report a high post light rail FAR average, for example, if all development that occurred after light rail was introduced was high density development.

Pre- and Post-LRT Density of Development. Prior to light rail's introduction, density of development within station areas was already greater than that of non station areas (with an average FAR of 0.64 versus 0.26). This indicates that light rail and at least some station areas were located in areas to which high density development has historically been directed. Examples include town centers (Cities of Hillsboro, Beaverton and Gresham) and the densest retail/office core portion of Portland's Central Business District.

However, the 'FAR premium' associated with light rail station areas also increased after light rail was introduced. This premium is defined as the difference between FAR within a station area versus FAR for the wider corridor. For the Blue Line alignment as a whole, the station area FAR *premium* increased from 0.38 to 0.65. (This means that after the implementation of light rail, the average FAR of station area development was 0.65 above that experienced for non station area development.)

A review of corridor segments indicates that FARs vary significantly along the alignment. Not surprisingly, the highest FARs are indicated for downtown Portland – both within and outside of station areas. For development that occurred after light rail was introduced, the station area FAR premium was a significant 7.2 above non station area development. This compares with a 2.02 FAR premium before light rail was introduced.

More moderate results are shown for the less urban station areas along the east and west Blue Line extensions. Within station areas, average FARs fall within a fairly narrow band: averaging 0.74 for the east extension and 0.88 for the west extension. The FAR premium realized for station area versus non station area development was 0.30 for the eastside and 0.47 for the west.

The downtown Portland experience differs from that of the suburban LRT segments, especially for residential development. This is likely due to factors beyond light rail that increased the attractiveness of residential development in other parts of downtown Portland located away from LRT. Based on other research conducted in Portland's Central City, these factors appear to include streetcar investment coupled with the significant former industrial acreage (at the northern and southern ends of downtown) made available for redevelopment.

In effect, Portland's Central City provides a more complex story due in part to the interaction of multiple transit modes and corridors. The downtown area is also a much denser environment to begin with. Consequently, the FAR premium associated with light rail stations should be considered a measure relative to each station area's existing environment and development character rather than as an absolute measure that can be precisely replicated in stations areas of less similar development character and market opportunity.

In summary, this analysis indicates that the introduction of light rail correlates with density increases within station areas well above what is reported for non station area development.

2. Condo Development

Table 1 also provides information on condominium development, primarily residential condominiums. Condo development is reflected within the FAR calculations, but also reported separately to illustrate the increased capture rate that station areas of what are typically higher-density residential units achieved after the introduction of light rail.

In total, LRT station areas increased their capture of condominiums from 14% of all units developed (within the two comparison study area geographies) before light rail was introduced to 56% after light rail's introduction. This remarkable shift in where condo development occurs becomes even more significant given the increase in average number of condominium units developed annually in the post light rail period – during what has proved to be a very active period of urban residential development.

The east and west suburban extensions report very high station area condominium capture rates (48% and 57% respectively) after light rail is introduced. Downtown station areas also report increased capture, increasing form about 8% to a still relatively modest 13% after light rail was introduced. Again, this lesser rate of growth in downtown market capture can be attributed to the presence of major redevelopment sites at the periphery of downtown which have oriented to introduction of Portland Streetcar service.

3. Rate of Development

The third variable considers the total volume of development and the rate at which new development is realized (relative to the in-place, pre-LRT building stock). This measure is determined by calculating the average annual square feet developed after light rail's introduction as a percentage of the total square feet developed prior to light rail's introduction. In effect, this approach measures average net additions to the total building inventory on the ground.

Table 2 (on the following page) also reports the prevalence of vacant land within and outside of station areas, as availability of vacant land can be a factor in affecting the location of new development.

Annual Rate of Development. Across the full length of the Blue Line alignment, research data indicates that the *average annual rate* of development within station areas was 2.7% of existing development, or about 1.1 million square feet per year. This rate is 69% greater than the rate of development in non station areas (of 1.6% per year).

Station areas captured 27% of all square footage constructed post light rail. By comparison, LRT station areas comprise only 10% of the corridor-wide study area's total acreage (and 14% of vacant acreage).

Table 2. MAX Blue Line Rates of Development (Pre- and Post-Light Rail)

	Land Acres			Building Square Feet				
	Total Land Area	Vacant prior to LRT	% Vacant prior to LRT	Developed Post LRT	Developed Pre LRT	Developed Per Year Post LRT	Annual Rate	Station Area Rate Premium
TOTAL ALIGNMENT								
Station Area	2,987	1,143	38%	19,673,000	42,187,000	1,143,000	2.7%	69%
Non Station Area	26,760	6,957	26%	46,037,000	195,268,000	3,124,000	1.6%	
Total	29,748	8,100	27%	65,710,000	237,455,000	4,267,000	1.8%	
EAST								
Station Area	1,484	557	38%	9,045,000	14,480,000	431,000	3.0%	238%
Non Station Area	12,000	2,656	22%	20,663,000	111,723,000	984,000	0.9%	
Total	13,483	3,214	24%	29,708,000	126,203,000	1,415,000	1.1%	
DOWNTOWN								
Station Area	152	50	33%	7,387,000	18,502,000	352,000	1.9%	-38%
Non Station Area	345	169	49%	10,699,000	16,632,000	509,000	3.1%	
Total	497	219	44%	18,086,000	35,134,000	861,000	2.5%	
WEST								
Station Area	1,352	535	40%	3,241,000	9,205,000	360,000	3.9%	61%
Non Station Area	14,415	4,132	29%	14,675,000	66,913,000	1,631,000	2.4%	
Total	15,767	4,667	30%	17,916,000	76,118,000	1,991,000	2.6%	

Source: RLIS, E.D. Hovee & Company, LLC.

Central City & Suburban Experience. Rates of development varied across the geographies considered in a similar fashion as development density. The two suburban geographies exhibit more similarities in response to the introduction of light rail than the downtown geography.

For the east and west extension station areas, the rate of development was 3.0% and 3.9% respectively post LRT. Along the east extension, the station area rate of development was significantly higher than in non station areas (238% higher). Along the west extension, the difference was less dramatic (station areas developed 61% more rapidly).

The greater *bump* (or increase) in westside development is likely related to the greater prevalence of greenfields newly available for development on the west side of the region. Greenfield sites offered greater opportunity for more significant increases in the rate of development (on a smaller existing building stock) outside of Westside station areas compared with development outside of eastside station areas (which had less vacant land pre LRT).

In the downtown geography, the rate of development within station areas experienced after LRT introduction was actually lower than in non station areas (1.9% versus 3.1% annually). Again, this is related to factors beyond light rail that increased the attractiveness of development in competing and previously underdeveloped portions of Portland's Central City.

Of particular note are major master planned developments in association with the streetcar corridors in the Pearl District and, more recently, South Waterfront. By comparison, downtown

LRT was constructed through the heart of the already densely developed downtown retail and office core.

4. Vacant Land Availability

Table 2 also provides information on percentage of land vacant within each geography prior to light rail's introduction. Overall, with the exception of downtown, LRT station areas are estimated to have had a higher percentage of vacant land prior to light rail's introduction (38% within station areas, versus 26% outside of station areas). However, the 26% share of acreage in non station areas that was vacant prior to light rail's introduction is still a high enough percentage to have accommodated market-driven development activity.

One test of whether availability of vacant land inhibited development within the time period studied is whether vacant land remains in the comparison geographies or if it was fully absorbed. The proportion of station area land that is vacant is estimated to have declined from 38% pre LRT to 29% within station areas as of 2007, and from 26% of total corridor land area to 21% outside of station areas.

Vacant land has decreased over the time period studied, but significant vacant land remains for both the immediate station area and wider LRT corridor geographies. This suggests opportunities for continuing higher density development in proximity to light rail in the years ahead.

5. Rate of Development of Low Value Lots

As a final measure, the rate of development was also calculated as the percentage of low value lots that redeveloped. Two value categories for redevelopment sites were identified and utilized:

- The first category is termed 'low value', and corresponds to an improvement to land value ratio of less than 0.5 (meaning that any building on a property is worth no more than half of the underlying land value).
- The second is termed 'moderate value' and corresponds to an improvement to land value of 0.5-1.0 (meaning that any building on a property is worth over half the land value but no more than the property's value land).

Data for land and improvements valuation represents real market valuations as determined by respective County assessors. As illustrated by the following chart, the overwhelming majority of lots that have experienced redevelopment fall within these two categories, with about two thirds falling in the lowest value category (of less than 0.5 improvements to land valuation).

This variable is calculated as a basis for application to prospective future development along the Portland-Milwaukie alignment. By adjusting experience of the Blue Line to the varied existing built environments this proposed new light rail corridor, it is possible to better account for the distinctive characteristics of land supply surrounding each station for this new LRT corridor.

A limitation of this approach is that it is based upon a smaller subset of lots as historic value data was not available for all 114,000 taxlots within the MAX Blue Line data set. Lots without historic data are likely newly created lots through land divisions, land aggregations, or condominium development.

This limitation proved more problematic in some geographies than others. Along the west extension after 1998, for instance, only 5% of station area development is associated with value data. Tax lot data for post light rail development within east extension station areas, in contrast, is 74% populated – making this more useful as a basis for projection of new LRT corridors.

Because the *east extension* (east of downtown) is best populated with value data, its rate of redevelopment for low value land is used as the basis for estimating the redevelopment rate for low value land surrounding the Milwaukie alignment.

Table 3. Eastside Blue Line Redevelopment of Low Value Lots

	Improvement : Land Value Ratio				No Value
	Low Value: <0.5	Moderate Value: .5 - 1	High Value: 1+	Total	Data
Station Area					
Total Acreage	299	122	927	1,348	90
Acres that redeveloped	37	7	11	54	22
Percent redeveloped	12%	6%	1%	4%	25%
Annualized	1.7%	0.8%	0.2%	0.6%	3.5%
Non Station Area					
Total Acreage	1,662	617	8,858	11,136	451
Acres that redeveloped	132	18	24	174	147
Percent redeveloped	8%	3%	0%	2%	33%
Annualized	1.1%	0.4%	0.0%	0.2%	4.7%

Note: The annualized rate divided the percent of acres redeveloped by the applicable number of post light rail years (for the east extension, this is 21).

Source: RLIS, Multnomah County Division of Assessment & Taxation, E.D. Hovee & Company, LLC.

Interaction of Station Proximity & Low Value Lots. In addition to low value lots serving as the source of the majority of development post LRT, not surprisingly these properties also experience the highest rates of redevelopment. Low value lots experience a redevelopment rate of 1.7% per year within station areas, while high value lots redevelop at a rate of only 0.2%.

However, this table also indicates that station area redevelopment cannot be solely explained by a greater prevalence of low and moderate value lots: 12% of low value acreage redeveloped within east extension Blue Line station areas compared with a lower 8% figure for low value non station area acreage. Similarly, 6% of moderate value acreage redeveloped within east extension Blue Line station areas compared with 3% of moderate value non station area acreage.

While there are differences in redevelopment rates due to existing value of improvements, proximity to the LRT station also clearly plays a role. It is the interaction of these two variables – station area proximity and improvement to land value ratios – that are applied to project development potentials for the proposed Portland-Milwaukie alignment. Implications of Table 3 are further discussed in the Portland-Milwaukie Line Implications section of this memo.

PORTLAND-MILWAUKIE LINE IMPLICATIONS

As proposed, the Milwaukie line will extend light rail transit from the southern end of the downtown transit mall (currently under construction), across the Willamette River on a new transit bridge, and south past the City of Milwaukie. The line will total approximately 7.5 miles.

Eleven stations are currently under planning consideration for this line – including eight east of the Willamette (eastside) and three within Portland's Central City on the west side of the Willamette (Westside). The alignment is illustrated on the following page, along with the ¼ mile station area geography.

To illustrate how light rail transit investment may influence development trends, two elements of the Blue Line experience and analytic methodology have been applied to projections of potential development reasonable to expect with the proposed Portland-Milwaukie line:

1. Rate of redevelopment of low and moderate value taxlots within station areas, and
2. FAR premium associated with station area proximity.

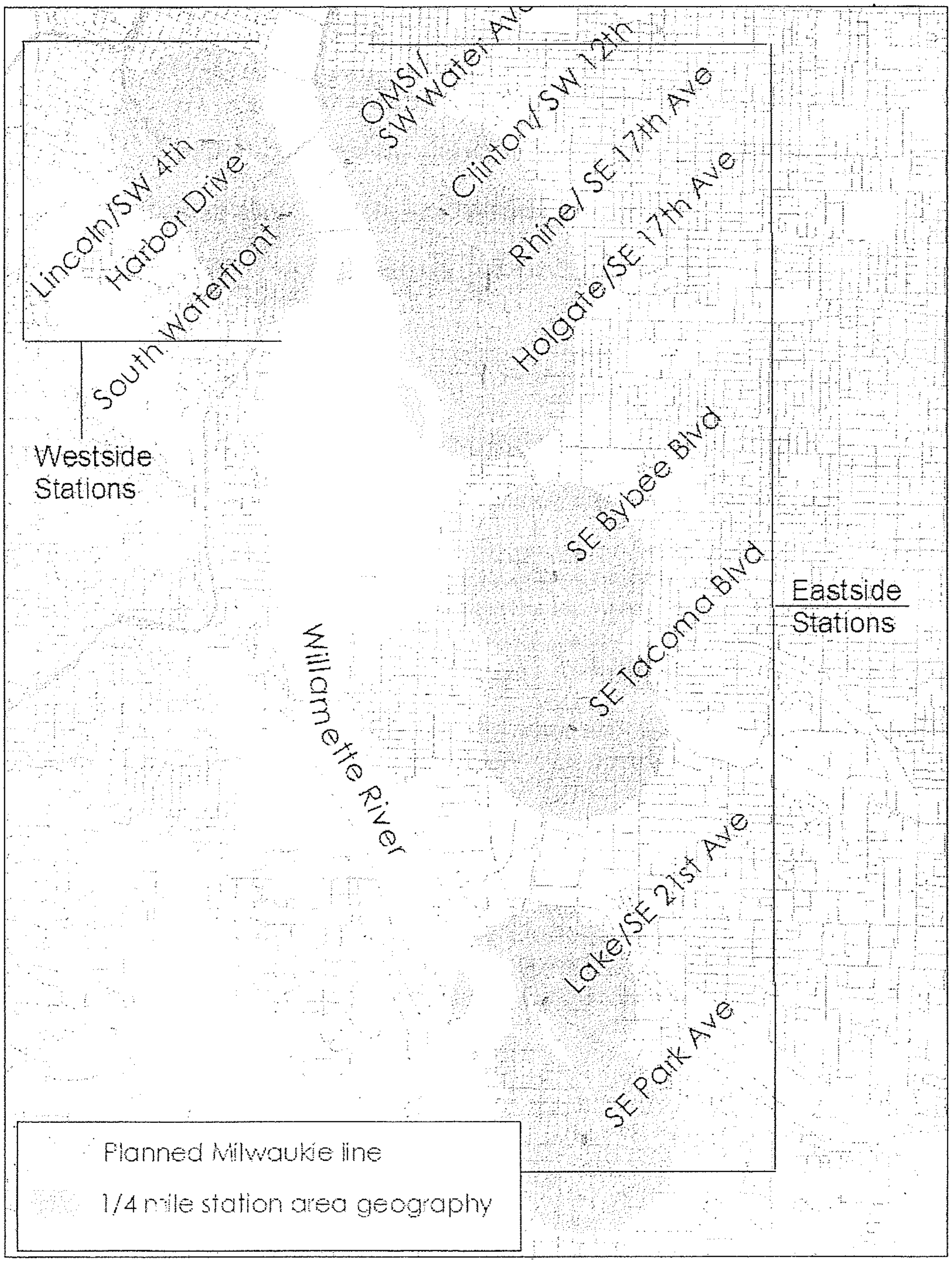
The first variable takes into account land availability within proposed station areas. Observed patterns of development indicate that the bulk of land that redevelops falls within certain low and moderate improvement to land value ratios. Future development within Milwaukie station areas will in part be driven by the availability of sites within these value ratios.

The second variable illustrates the likely character of development that may be anticipated within proposed station areas. This in turn influences the total square footage that may be realized on lots that redevelop.

Observed development in existing station areas also indicates that station areas have achieved higher densities than surrounding development. This premium has been *added to* the average FAR of development surrounding the Portland-Milwaukie line. The formula utilized is:

(Land to Redevelop) x (Projected FAR) = (Square Footage of Added Development)

Figure 2. Portland-Milwaukie Line Station Areas



Source: RLIS, Tri-Met, E.D. Hovee & Company, LLC.

Land Availability

Within a one-quarter mile radius of the Portland-Milwaukie line's eight eastside station areas there are a total of 210 acres identified as being of low and moderate value (in terms of improvement to land value ratios). In its three Westside station areas there are 93 acres, for a total of 303 acres within all station areas.

Table 4. Low Value Lots within Portland-Milwaukie Station Areas

Improvement: Land Value	Acres per Station Area: Eastside Station Areas								
	Park	Lake	Tacoma	Bybee	Holgate	Rhine	Clinton	OMSI*	Subtotal
Low Value: <0.5	15.4	30.7	28.7	1.0	12	12.0	11.5	14.5	126.1
Moderate Value: 0.5 - 1.0	28.9	3.3	18.2	1.3	10	10.2	8.5	3.8	83.8
Total	44.3	34.0	46.9	2.3	22.0	22.2	19.9	18.3	210.0

*Note: Low value land owned by OMSI has been removed from this area, as institutional development has been projected through a separate methodology described below.

Source: RLIS, Tri-Met, E.D. Hovee & Company, LLC.

Land Exclusions. Land owned by two institutions – Oregon Museum of Science and Industry (OMSI) and Oregon Health & Science University (OHSU) – has been removed from this tally, as institutional development is expected to reflect institutional planning and funding availability rather than more typical market-driven and generalized economic/development trends. Development potential for the OMSI/OHSU sites is estimated separately.

Redevelopment Potential. The redevelopment rate for low and moderate value land observed within Blue Line east extension station areas has been applied to Portland-Milwaukie station areas. The result illustrates the total acreage that could reasonably be expected to redevelop within Portland-Milwaukie station areas over an approximate 20 year time period.

The annual rate of redevelopment observed for the east Blue Line extension as applied to the Portland-Milwaukie line for low value acreage is 1.7%, twice the redevelopment rate for moderate value acreage (0.8%). Application of these observed eastside rates results in close to 100 acres of Portland-Milwaukie station area development over 20 years, at which point about 200 acres of low and moderate valued land would remain undeveloped (or not redeveloped).

Table 5. Potential Redevelopment within Portland-Milwaukie Station Areas

Improvement : Land Value	Acres per Station Area: Westside Station Areas South Waterfront*	Harbor Drive	Lincoln	Subtotal	Total Low Value Acres	Total Alignment Development Rate	Total Acres Developed	Remaining Low Value Acres
Low Value: <0.5	34.0	14.7	18.2	67.0	193.1	1.7%	79.9	113.3
Moderate Value: 0.5 - 1.0	3.0	9.1	14.0	26.2	110.0	0.8%	18.6	91.3
Total	37.0	23.9	32.3	93.1	303.1	1.4%	98.5	204.6

*Note: Low value land owned by OHSU has been removed from this area, as institutional development has been projected through a separate methodology described below.

Source: RLIS, Tri-Met, E.D. Hovee & Company, LLC.

Resulting Station Area Development

The density of development that 100 acres of land may produce is illustrated through both observed FARs and the FAR premium realized within Blue Line station areas. The current FAR of station areas varies significantly between eastside and downtown stations. Lots developed within eastside Blue Line stations indicate low, suburban densities of 0.24 whereas downtown lots report densities nine times as high (2.21).

An FAR *premium* of 0.35 – the average of the east and west Blue Line extensions – was applied to both geographies of the proposed Portland-Milwaukie alignment. While Blue Line downtown stations reported an FAR premium of 7.2, the more conservative suburban average was utilized instead given the complexities of development impacts and varying FAR limits within the downtown geography (as previously described).

Table 6. Illustrative Development for Portland-Milwaukie Station Areas

Geography	Current FAR	LRT Premium	Post LRT FAR	Acres to Redevelop	Post LRT Building SF	Building SF Without LRT	Building SF Premium
Eastside Station Areas	0.24	0.35	0.58	210.0	5,330,000	2,171,000	3,159,000
Westside Station Areas	2.21	0.35	2.55	98.5	10,958,000	9,476,000	1,482,000
Institutions							
OMSI (Eastside)				25.5	450,000	200,000	250,000
OHSU (Westside)				7.7	2,000,000	1,898,000	89,000
Total	2.45	0.69	3.14	341.7	18,726,000	13,745,000	4,980,000
Light Rail Premium (added to SF w/o LRT)							+ 36%

Source: RLIS, Tri-Met, OMSI, OHSU, E.D. Hovee & Company, LLC.

The resulting illustrative FAR of future Portland-Milwaukie station area development is 0.58 for eastside station areas and 2.55 for downtown station areas. Application of these FARs results in a combined estimate of 18.7 million square feet of new development within Portland-Milwaukie LRT corridor station areas.

A portion of this potential development square footage is associated with a light rail transit premium corresponding to the light rail FAR bonus. The building square footage that may be realized *without* light rail investment has been calculated as [Acres to Redevelop x Current FAR].

The difference between this number and the Post Light Rail Transit building SF [Acres to Redevelop x Post LRT FAR] is dubbed the *light rail premium.* In total, this premium accounts for 27% of post light rail development, or *an added 36%* of development above what could be expected to occur in the absence of LRT development.

The estimated LRT premium is considerably higher for Milwaukie-Portland line eastside station areas (estimated at an added 146%). By comparison, the Milwaukie-Portland line westside station area premium is considerably lower (estimated at an added 16%). This is in part due to a larger *institutional bump* associated with the OMSI master plan (eastside) than for OHSU (westside). Institutional development adjustments are further described further below.

This can be viewed as an inherently conservative approach, because it projects the results of past development trends forward into a new and increasingly urban era of development. For example, it can be expected that the development environment will be increasingly land-constrained, leading to densities of development above those projected based on historical experience to date.

Institutional Development. As noted, institutional development has been treated separately, due to the presence of the OMSI and OHSU institutions – each with significant vacant acreage in close proximity to two planned light rail stations:

- OMSI controls over 25 vacant acres within the OMSI station area. The institution's plans call for two phases of future development. Phase I plans call for a 100,000 square foot museum expansion and a 100,000 square foot science academy to be run in partnership with Oregon Health & Science University and attract high school students from throughout the state.

  Phase II plans expand the institution's current initiatives into office development compatible with its science focus. Construction is currently planned for the 2013-2014 time period. Current zoning would enable the development of over one million square feet. To err on the conservative side, this analysis assumes that one-quarter as much square footage is actually developed over a 20-year period.

  Of OMSI's future planned development, the estimated 250,000 square feet associated with Phase II has been attributed to light rail development due to the pivotal role that light rail will play in connecting OMSI's property directly with OHSU – across the Willamette River – and surrounding CBD office development. OMSI's light rail premium is high due to the dramatic increase in connectivity that light rail investment will bring between Portland's Central Business District and the OMSI campus. This LRT premium can be deemed as pivotal in OMSI's plans to venture into a new development arena.

- OHSU controls close to eight vacant acres within the South Waterfront station area, an area with a high base FAR zoning limit of 6:1. A March 2008 draft program summary for this acreage – known as the Schnitzer Campus – calls for almost 2 million square feet of development at full built out.

Of this development, 4.5% has been attributed to light rail based upon mode split projections obtainable at the time this memo was completed. DKS Engineering has estimated transit ridership in the northern section of the South Waterfront district at full build out (2030).

In 2030, nine percent of employees are projected to arrive at work via transit in this district with limited road access capacity. Planned transit includes buses, streetcar and light rail. Due to its greater ridership capacity, LRT service is assumed to accommodate about half of these commuters, or 4.5% of employees. As a percentage of building square feet, this equates to 89,000 square feet. The light rail premium estimated for OHSU based on this analysis is therefore significantly more conservative than that estimated for OMSI's planned development.

Institutional land ownership has been projected separately for the Portland-Milwaukie station areas because development of this land can be expected to respond to institutional master planning and institutional funding availability more than general economic trends in job and housing growth. The two station areas that are dominated by institutional land ownership within the proposed Portland-Milwaukie alignment can be considered as unique to the MAX light rail system.

Similar patterns of extensive institutional land holdings in direct proximity have not yet occurred to the same degree along the east or west extensions of the Blue Line. There are examples of institutions near Blue Line stations, such as Providence and Adventist Hospitals or the Gresham and Hillsboro civic center complexes – but not in as direct proximity nor with the same degree of land available for added institutional expansion.

Valuation of Development

Cumulative market valuation associated with new development potentials identified over an approximate 20-year post-LRT time period is estimated at $3.86 billion for Portland-Milwaukie station areas. Without light rail, the added property valuation anticipated estimated is $930 million less at $2.93 billion. Valuation estimates are expressed in terms of real market value (RMV) based on current construction and related development costs for similar project types and locations in the Portland metro area.

Table 7. Potential Valuation of New Development in Portland-Milwaukie LRT Station Areas

	Millions of 2008 $
Total Potential w/LRT	$3,860
Without LRT	$2,930
LRT Premium	$930
LRT Premium %	+32%

Source: E.D. Hovee & Company, LLC.

In effect, potential valuation increases by nearly one-third (32%) above what could be expected in the absence of the planned LRT investment. This 32% add-on represents the *LRT premium* for a more rapid rate and higher density of development that could reasonably be anticipated with Portland-Milwaukie LRT consistent with observed Blue Line development experience.

Portland-Milwaukie Line Implications Summary

In total, the 342 acres of low and moderate value land associated with Portland-Milwaukie line station areas as illustrated are projected to support an estimated approximately 18.7 million square feet of new residential and employment development within 20 years of light rail investment. In the absence of light rail investment, the new development estimate decreases to 12.5 million square feet.

The difference between these two estimates is close to 5 million square feet. This difference equates to a 36% increase above baseline projections without LRT. This can be considered as the *development premium* potentially associated with Milwaukie line transit oriented investment.

Additional Development Influences

As stated in the introduction to this MAX light rail and development analysis, land development typically responds to a wide range of influences. This analysis has focused on three of importance for the LRT system: light rail investment, proximity to light rail stations and land value.

Several additional influences are discussed below to provide a brief overview of how these factors may also affect future development that may accompany Portland-Milwaukie line transit investment in ways that vary with observed development surrounding Blue Line stations.

- **Economic cycles**: In general, both land development and real estate appreciation will respond positively to overall regional job growth. East extension development encompasses a time frame (1986-2007) that includes significant regional job growth during the mid and late 90s. Some of these growth years also correspond to the post light rail period for the Westside extension (1998-2007), especially for residential and associated mixed use. The Westside experience is moderated in part by regional job losses in 2002 and 2003.

  Given the fairly long time frames utilized for this analysis – of 9-21 years that the west and east segments of the MAX Blue Line experience represent and the 20 year time horizon as applied for projected Milwaukie line investment – economic cycles are not expected to significantly distinguish observed development trends from future development trends over this longer term (two decade) planning horizon.

- **Housing boom**: The rapid rise in housing prices experienced through mid-2007 surpassed all housing booms on record (since roughly mid century). This generated high rates of housing development as investors sought new instruments for their money and took advantage of the buying power provided by historically low interest rates. While the pace of residential development experienced during the peak years of the recent housing

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boom will not likely be replicated within the 20 years of Portland-Milwaukie line light rail investment, the fundamentals of continued residential demand appear to be in place once the housing market rebounds.

An aging population combined with continued in-migration means that housing needs will continue to change, albeit in ways that may be less predictable than in recent years. Consequently, this variable should be considered as a risk factor that may serve to depress the future pace of development below observed development trends.

- **Land configuration/lot size**: Land configuration influences development because larger, regularly shaped lots are generally easier to develop than smaller and/or irregularly shaped lots. This is not a factor that has been directly evaluated or documented as part of this analysis.

  For Blue Line station areas that were constructed through greenfield areas (as with Orenco Station and Gresham Town Center), large site master planning helped to facilitate development that could best respond to light rail investment. However, while a handful of Blue Line station areas were largely undeveloped, the majority of stations were introduced into largely built environments (as in the downtowns of Beaverton and Hillsboro and the residential neighborhoods of east Portland and Gresham).

  Most of the Portland-Milwaukie station areas can also be described as largely built out, but also representing a variety of land uses and with at least 30% of their combined acreage estimated to be vacant. Due to the variety represented with the existing 56 Blue Line stations and 11 prospective Portland-Milwaukie line stations, this variable is not considered a substantial risk factor that would cause future Milwaukie development to diverge substantially from observed Blue Line development.

- **Access and proximity to households, employment and retail amenities**: Development is more attractive – yielding higher returns to developers and investors – when locational amenities are high. Nearby retail represents an amenity increasingly sought by both housing (particularly non single family housing) and employment uses. Station area development can be expected when amenity-rich environments are provided.

  Within Blue Line station areas, amenity levels varied widely. Blue Line stations include smaller, historic downtowns and shopping districts struggling to attract and retain tenants and as well as stations within downtown Portland, the region's largest office market and the primary source of the region's recent and dramatic investment in condominium development.

  The proposed Portland- Milwaukie line station areas encompass a similar diversity of environments. These include the City of Milwaukie's historic downtown, newly available formerly industrial land in southeast Portland, the successful neighborhood shopping district of Bybee-Sellwood, and two stations currently dominated by vacant institutional land ownership. In effect, varying amenity levels are not considered a risk factor causing future development to diverge from observed development.

- **Public-private partnerships**: Public planning commitment and investment can propel development sooner and at greater densities than the market would otherwise deliver on its own. These partnerships have been important in the Central City, especially with major master planned developments as with Hoyt Street Yards in the Pearl District and the Central District in South Waterfront.

  While comparably sized site developments have not been as widely experienced outside the Central City, other public-private partnerships scaled to the properties available, local government capacities and the market have played a role along the Blue Line. Examples range from Orenco Station in Hillsboro to Russellville in East Portland and the Civic Station in Gresham.

  With this analysis, it is assumed that similar efforts may be made in Milwaukie station areas, especially within Urban Renewal Areas (which encompass the downtown Portland station areas and the OMSI station area). These efforts will be particularly important in the early years after light rail is introduced – for early phase catalyst projects.

- **Regulatory constraints**: Development throughout the metro area must respond to local jurisdiction comprehensive planning and zoning. This generally is not considered a limiting factor, as zoning along the Blue Line generally allowed for far greater development (higher FARs) than was actually realized. An exception is noted for station areas with high proportions of single family use for which land use designations remained largely unchanged.

  A brief review of zoning within Milwaukie station areas indicates that zoning constraints along this planned alignment also generally should not limit planned development, at least as far as building size is concerned. Whether zones are otherwise conducive to development in terms of the uses allowed and site design requirements has not been directly evaluated as part of this overview research assignment.

  Parking requirements have been eliminated for properties in Portland adjacent to light rail. Similarly, the City of Milwaukie has minimum and maximum parking requirements that give transit-oriented development more flexibility in providing parking, a factor that can otherwise be a potentially significant constraint for the development community in achieving higher transit-supportive densities.

Detailed Research Methodology

The methodology for this analysis is separated into documentation of Blue Line development trends and the transference of these trends onto the Milwaukie station areas.

Observed Development Trends: Blue Line

Two study areas were employed:

1. Existing station areas, defined as taxlots with their center within one-quarter of a mile of an existing light rail station. Taxlots within station areas comprise 2,987 acres.
2. Non station areas, a comparison geography defined as a corridor extending one mile on either side of the Blue Line, excluding station areas. In total, taxlots within the non station area geography total 26,760 acres.

Together, the study areas total roughly 114,000 taxlots. The following attributes were determined for each taxlot:

1. Whether developed. A taxlot was classified as undeveloped if:
   - It had no associated year built or building square footage data, and
   - Building value was $35,000 or less
   - Lots that could be identified as parks – through ownership or property class ID – were removed from the tally of vacant of undeveloped land.
2. If developed, in what year (to determine if developed pre or post light rail.)
3. If developed, total square footage
4. Estimated market value of taxlots, 1999 and 2007

Taxlots were divided into three databases that correspond both to different light rail opening years and development contexts. These databases are:

1. East of the Willamette (Gresham to Portland's Central Eastside, light rail opened in 1986);
2. Downtown (the Central Business District, light rail opened in 1986); and
3. West of I-405 (from the CBD to the City of Hillsboro; light rail opened in 1998).

The break off for 'pre' or 'post' light rail development thus differs along the alignment.

Table 8. Blue Line Study Areas Taxlot Summary

	East of the Willamette	Downtown	West of I-405	Total
		Excludes condos		
Post Light Rail				
Station Area	790	43	866	1,699
Non Station Area	4,246	106	6,859	11,211
Pre Light Rail				
Station Area	3,042	425	1,566	5,033
Non Station Area	42,512	419	24,972	67,903
Undeveloped Lots				
Station Area	737	158	440	1,335
Non Station Area	3,685	219	4,074	7,978
Lots with Insufficient Data				
Station Area	52	25	393	470
Non Station Area	168	47	1,153	1,368
Public Use Lots (Washington County only)				
Station Area			179	179
Non Station Area			1,266	1,266
Total Lots	55,218	1,442	41,768	98,428
		Condo units only		
Post Light Rail				
Station Area	515	346	1,733	2,594
Non Station Area	547	2,735	1,321	4,603
Pre Light Rail				
Station Area	140	153	759	1,052
Non Station Area	2,398	1,853	3,290	7,541
Total condos	3,600	5,087	7,103	15,790

Source: RLIS, E.D. Hovee & Company, LLC.

Taxlots attributed were determined via RLIS data (Regional Land Information System), May 2008 update, packaged by Metro Regional Government. Less than 2% of taxlots – excluding condos – had insufficient data to determine the year in which the lots was developed and its total built square footage. These lots were removed from the tally of developed lots, from which the rate and density of post and pre light rail development was calculated.

Condominiums: Condominiums were identified via tax assessor property class (several property classes describe different types of condominiums). Condominium taxlots were then identified as land or building via Geographic Information Systems (GIS) software, so that this property type could be used in Floor Area Ratio calculations.

Within the downtown geography – which has realized the greatest numbers of new condominiums in recent years – if some units within a building were missing year built or building square footage data, this was supplied. If no units had year built or building square footage information, the condo was excluded from the analysis. This was the case for approximately 65 downtown condominium units, likely very recently completed.

Converted space was not included in the condominium tally, only newly built square footage. This means that condominium projects that were formerly warehouses or apartments were not counted, as the focus of this analysis is change in the characteristics of net added development rather than use change.

Floor Area Ratio Calculations: Reported Floor Area Ratios are weighted for property/building size by summing up building square feet within a geography and timeframe (e.g. station areas pre light rail) and dividing by the sum of land area within the same geography.

Value Data: Value appreciation was calculated between 1999 and 2007 as 1999 was the earliest year for which historical assessment data was readily available. Historic data was provided by Multnomah County Division of Assessment and Taxation and by Washington County Department of Assessment and Taxation. Historic data could not be provided for lots created after 1999 (for instance, taxlots created through land divisions, or condominiums, which create a taxlot for each unit). Historic value data was provided for 75,601 taxlots out of 85,839 taxlots identified as developed (88%).

Rate of Low Value Lot Development: Historic value data was also used to determine the value of lots prior to their development. Lots that developed between 2000 and 2007 for which historic value data was available were classified into low and moderate value pre-development. These are defined through an improvement to land value ratio, the ratio of building value to the value of the land with which the building is associated.

The rate of low value lot development was based upon a smaller subset of taxlots, because historic value data was not available for a significant number of taxlots, particularly lots within Washington County (within the 'westside' database).

Beyond value data, lots were also removed that could readily be identified as parks as well as land owned by transportation organizations, railroads and utilities including Portland General Electric, as these ownerships correlate with a significantly reduced likelihood of land redevelopment.

Table 9. Developed Taxlots with Historic Value Data

	Percent of Developed Taxlots with Value Data			
Geography	**East**	**Downtown**	**West**	**Total**
Post Light Rail				
Station Area	74%	65%	5%	34%
Non Station Area	86%	69%	29%	45%
Pre Light Rail				
Station Area	98%	99%	87%	95%
Non Station Area	99%	99%	91%	96%

Source: RLIS, E.D. Hovee & Company, LLC.

The significantly lower percentage of Westside lots with associated historic value data could be due to a greater prevalence of lot divisions in that geography, particularly within station areas.

Projected Development Trends: Portland-Milwaukie Line

Only land within Portland-Milwaukie station areas (one quarter mile surrounding each station) was considered for this analysis. This equates to roughly 6,200 taxlots (including condominiums) comprising roughly 701 acres. The attributes assigned to these taxlots include:

1. Whether developed
2. If developed, total square footage
3. Whether a condominium
4. Improvement and land value 2007

The criteria for determining these attributes are as described for the Blue Line analysis.

A detailed break down of land availability within Milwaukie station areas is provided below by zone, although zone was not a variable utilized in this analysis. The table includes low value lots only (improvement to land value ratio of 0.5 or less).

Added valuation is projected based on current construction and related development (i.e. soft) associated with similar product types as of mid-2008. Square foot averages are applied to the development uses indicated as typical for eastside and westside residential and commercial uses plus institutional activities as represented by OMSI and OHSU. Construction cost data is from published estimates of the cost estimating firm Rider Levett Bucknall for the Portland metro area, as of the 2nd quarter of 2008.

Potential appreciation in land values that might occur with higher density development is not included with the estimates provided. From this perspective, the LRT development premiums calculated can be viewed as conservative estimates of the added valuation that might be realized.

Table 10 Portland-Milwaukie Station Area Low Value Lot Detail

		Park Ave		Lake Rd		Tacoma		Bybee		Holgate		Rhine		Clinton		OMSI		South Waterfront		Harbor Drive		Lincoln		Total	
	Zone	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size	Lots	Avg Size
County Milwaukie City	R1B			3	0.1																			3	0.1
	CL			1	0.2																			1	0.2
	M					24	0.3																	24	0.3
	DO			12	0.6																			12	0.6
	DOS			17	0.8																			17	0.8
	DR			3	0.4																			3	0.4
	DS			5	0.2																			5	0.2
	R2			6	1.2																			6	1.2
	R5	5.0	0.3	3	0.1	10	0.4																	18	0.3
	C3	14	0.7																					14	0.7
	HDR	3	0.2																					3	0.2
	MR1	2	0.2																					2	0.2
	R10	10	0.2																					10	0.2
	R7	10	0.2																					10	0.2
Portland City	CG					13	0.3			10	0.6	18	0.1	10	0.1									51	0.2
	CO2																	6	0.2	5	0.2			11	0.2
	CS													2	0.1							9	0.1	11	0.1
	CX																	9	2.1	24	0.6	1	0.0	34	1.0
	EG1									4	0.1	11	0.1	3	0.2			2	0.1					20	0.1
	EG2					4	2.1									1	1.2							5	2.0
	EX													18	0.1	25	0.2							43	0.2
	IG1									8	0.5	50	0.2	24	0.3									82	0.2
	IG2					2	0.2									10	1							12	0.6
	R1							1	0.1	14	0.1	1	0.9	2	0.0									18	0.2
	R2					4	0.1							2	0.1			1	0.0					7	0.1
	RH																	2	0.1			15	0.2	17	0.2
	RX																					57	0.3	57	0.3
	R2.5									1	0.1	1	0.1	4	0.1									6	0.1
	R5							3	0.3	37	0.3	2	0.1	3	0.0									45	0.3
	Total Lots/ Acreage	44	15.1	50	30.7	57	24.2	4	1.0	74	24.6	83	11.9	68	11.5	36	14.5	20	20.4	29	14.7	82	22.6	547	191.3
	Low Value % of Total Acreage		20%		36%		42%		1%		7%		15%		15%		27%		32%		23%		41%		18%

Note: Grey shading indicates single family residential zones.

Source: RLIS, E.D. Hovee & Company, LLC.

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS	))))))	RESOLUTION NO. 08- 3960B Introduced by Councilor Burkholder

WHEREAS, the Oregon and Washington sides of the metropolitan region are linked by critical transportation infrastructure vital to each community along the Columbia River; and,

WHEREAS, the I-5 Interstate bridge is a key transportation link that has national and international importance for freight and auto movement; and,

WHEREAS, the I-5 Interstate bridge carries approximately 130,000 people daily by car, truck, bus, bicycle and on foot; and,

WHEREAS, the CRC Draft Environmental Impact Statement (DEIS) analysis found that the segment of I-5 in the vicinity of the Columbia River has extended peak-hour travel demand that exceeds capacity, includes bridge spans that are over 50 and 90 years old and that do not meet current traffic safety or seismic standards, and,

WHEREAS, techniques to improve peak truck freight movement times along with bridge and highway improvements would help support and improve the economy of the region and beyond; and,

WHEREAS, the greatest inhibition to the predictable flow of truck freight is single-occupancy automobile commuting, and according to the CRC analysis, in the absence of tolling, other demand management, and good public transit service the growth of such automobile commuting will contribute to the costs of truck delay; and,

WHEREAS, travel by transit between Portland and Vancouver currently must share a right-of-way with autos and trucks; and,

WHEREAS, the bicycle and pedestrian facilities for crossing the Columbia River along I-5 do not meet current standards, that demand for such facilities is expected to increase, and that experience on Portland bridges has proven that when safe bicycle facilities are provided, ridership grows dramatically; and,

WHEREAS, the CRC DEIS states that in the absence of tolls, absence of effective high-capacity transit service, and absence of safe bicycle and pedestrian facilities, automobile traffic and its resulting emissions and impact on climate change would continue to grow faster with the "no build" option than such automobile traffic and emissions would grow with the replacement bridge option that does include tolls, effective transit, and safe bicycle and pedestrian facilities; and,

WHEREAS, because of high demand and because only two road crossings of the Columbia River exist in the metropolitan region, the I-5 and I-205 corridor is very well situated for tolling, a revenue source and management tool currently not feasible for many other projects vying for public funds; and,

WHEREAS, consideration should be given to potential diversion of traffic from tolling I-5 alone to I-205 and should consider tolling I-5 and I-205 with use of the revenue for both I-5 and I-205 in the Portland-Vancouver metropolitan area; and,

WHEREAS, the states of Oregon and Washington have both established aggressive climate change strategies that include significant reductions in vehicle miles traveled and/or greenhouse gas emissions during the expected life of a CRC project; and,

WHEREAS, in Washington State the goal is to reduce vehicle miles traveled by 50 percent by 2050 and in Oregon the goal is to reduce greenhouse gas emissions by 75 percent below 1990 levels by 2050; and,

WHEREAS, the Oregon Governor's Climate Change Integration Group in its final report dated January 2008 state that "reducing vehicle miles traveled is the single most effective way to reduce greenhouse gas emissions", and,

WHEREAS, the reduction of greenhouse gas emissions is a regional goal that the Metro Council has directed that methods of decreasing such emissions be identified and pursued; and,

WHEREAS the Metro Council has concurred with the Governor's Climate Change Integration Group that reducing vehicle miles traveled is the single most effective means of reducing greenhouse gas emissions; and,

WHEREAS, high capacity transit, as well as walking and biking reduce vehicle miles travelled and reduce greenhouse gas emissions; and,

WHEREAS, the Metro region and the Federal Transit Administration have made extensive investments in high capacity transit, especially light rail transit, as the preferred high capacity transit mode in most corridors in the region, including the Interstate MAX LRT line to the Expo Center, about 1 mile from Vancouver, Washington and adjacent to Interstate 5; and,

WHEREAS, on November 14, 2002 the Metro Council approved Resolution 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, that supported a multimodal project including light rail transit (LRT) and either a new supplemental or replacement I-5 bridge; and,

WHEREAS, the I-5 Transportation and Trade Study also included recommendations to widen I-5 to three lanes between Delta Park and Lombard, address finance issues, use travel demand tools including pricing (tolls), address environmental justice through use of a community enhancement fund, coordinate land use to avoid adverse impacts to transportation investments and improve heavy rail; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that "all transportation alternatives be evaluated for their land use implications...[because] added lanes of traffic ...will have an influence on settlement patterns and development"; and,

WHEREAS, the CRC Task Force's endorsement of a locally preferred alternative is one "narrowing" step in a multi-step process and is an important opportunity for the Metro Council to articulate its concerns which will be weighed at this and subsequent steps; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that Metro "will need to work closely with you as your project proceeds and as the RTP policies are developed to ensure that your proposals are consistent with our new policies."; and,

WHEREAS, the CRC Task Force, a 39 member advisory committee, has met regularly for over two years creating a project purpose and need, evaluation criteria and alternatives; and,

WHEREAS, a draft environmental impact statement has been completed that assesses the potential impacts of the project alternatives including a No Build, replacement and supplemental bridge options and bus rapid transit and light rail transit as well as bicycle and pedestrian facilities; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge and/or rehabilitating and keeping the existing bridges, could improve safety by providing travel lane designs that meet safety standards including improved sight distance, greater lane widths, improved road shoulders and would eliminate bridge lifts which are indirectly a major cause of rear end accidents on and near the bridge; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, would reduce auto and truck delays that result from bridge openings; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, could improve the seismic safety of those crossing the river by auto and truck, reducing the potential for economic disruption as a result of restricted truck freight movement from seismic damage as well as reduce the potential for river navigation hazards created by seismic events; and,

WHEREAS, high capacity transit in an exclusive right-of-way would provide greatly improved transit service with much better schedule reliability and service than mixed-use traffic operation; and,

WHEREAS, LRT would produce higher total transit ridership in the corridor than BRT; and,

WHEREAS, LRT is more cost effective than Bus Rapid Transit (BRT), and is about one-half as expensive to operate per transit rider crossing the river; and,

WHEREAS, the Metro Council held a public hearing about the CRC project alternatives on June 5, 2008 and,

WHEREAS, on June 5, 2008, the Metro Council approved Resolution No. 08-3938B For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project and that the Metro Council concluded in this resolution its support for a Columbia River Crossing (CRC) Project with light rail, a replacement bridge with three through lanes and tolls for travel demand management and ongoing funding but also included substantial conditions; and,

WHEREAS, the CRC Task Force has recommended a locally preferred alternative that includes light rail transit and a replacement bridge; and,

WHEREAS, on December 13, 2007, the Metro Council approved Resolution No. 07-3831B, For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis, and the adopted 2035 Regional Transportation Plan (RTP), Financially Constrained System Project list includes Metro project number 10866, "Improve I-5/Columbia River bridge (Oregon share)" with $74 million year of expenditure reserved for preliminary engineering and right-of-way acquisition, but does not include funds for project construction; and,

WHEREAS, on February 28, 2008, the Metro Council adopted Resolution No. 08-3911, For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program, and this air quality conformity included the CRC project, highway and light rail transit; and,

WHEREAS, the CRC Project is projected to cost between $3.5 and 3.7 billion dollars; and,

WHEREAS, a revenue forecast has been completed using best available information that shows revenue sources that could fund the project; and,

WHEREAS, the Metro 2035 RTP does not currently include a description of the proposed locally preferred alternative for the CRC Project as supported by the Metro Council; and,

WHEREAS, state law provides for land use final order to address meeting the potential land use impacts of light rail and related highway improvements in the South/North corridor of which the I-5 bridge is a part; and,

WHEREAS, at its meeting on July 10, 2008, the Joint Policy Advisory Committee on Transportation recommended approval of the following; now therefore,

BE IT RESOLVED that the Metro Council:

1. Continues to support a balanced multi-modal approach of highway, high capacity transit, freight movement, transportation demand management and bicycle and pedestrian improvements in the Columbia River Crossing corridor, as well as compact land use development patterns with a mixture of uses and types of housing which minimize long commutes and reduce our citizen's automobile dependence.
2. Supports a Columbia River Crossing locally preferred alternative:
   a. a replacement bridge with three northbound and three southbound through lanes, with tolls used both for finance and for demand management, as the preferred river crossing option,

   b. light rail as the preferred high capacity transit option, extending light rail from the Expo Center in Portland, Oregon across Hayden Island adjacent to I-5 to Vancouver, Washington,

   c. a light rail terminus in Vancouver, Washington.
3. Finds that the following concerns and considerations will need to be addressed as described in Exhibit A, attached. Metro will invite public review and discussion on the issues raised in Exhibit A.
4. Amends the Metro 2035 Regional Transportation Plan, Appendix 1.1, Financially Constrained System, Project Number 10866 to read: "Improve I-5/Columbia River bridge in cooperation with

ODOT and WSDOT with light rail transit, reconstructed interchanges and a replacement bridge with three through lanes in each direction and tolls designed to manage travel demand as well as provide an ongoing funding source for project construction, operations and maintenance." Further, amends the Project amount to read: "A range of between \$3.5 and \$3.7 billion."

5. Amends the Metro Appendix 1.2, "2035 RTP Other Projects Not Included in the Financially Constrained System", deleting Project number 10893, "Improve I-5/Columbia River bridge (Oregon Share)" and deleting Project number 10902, "CRC – Expo to Vancouver, north on Main to Lincoln", as these projects are now included in the Financially Constrained System.
6. Amends the Metro 2035 RTP, Chapter 5, Financial Plan, by adding Section 5.3.4, CRC Funding Assumptions, attached as Exhibit B.
7. Amends the Metro 2035 RTP, Chapter 7, Implementation, amending Section 7.7.5, Type I- Major Corridor Refinements, Interstate-5 North (I-84 to Clark County) as described in Exhibit C, attached.
8. Defers the determination of the number of auxiliary lanes to a subsequent amendment of the 2035 RTP, based on additional analysis.
9. Acknowledges that a land use final order for addressing land use consistency for the Oregon side of the Project is being prepared and will be submitted to the Council for approval in Fall 2008.

ADOPTED by the Metro Council this 17th day of July, 2008.

David Bragdon, Council President

Approved as to Form:

Daniel B. Cooper, Metro Attorney

Officially Approved
Approvato Ufficialmente
Consiglio Metropolitano
METRO COUNCIL
Metro Council

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RESOLUTION O8-3960B
Exhibit A

Metro Council Concerns and Considerations
Columbia River Crossing "Locally Preferred Alternative"

The Metro Council recognizes that endorsement of a "Locally Preferred Alternative" is one important narrowing step that enables the project management team to proceed with further analysis of a reduced range of alternatives. The Council is cognizant that many important issues are generally still unresolved at the time of endorsement of an LPA, but that clear articulation of concerns is required to make sure that such unresolved issues are appropriately resolved during the next phase of design, engineering, and financial planning, with proper participation by the local community and its elected representatives. If those sorts of outstanding issues are not satisfactorily resolved during that post-LPA selection phase, then the project risks failing to win the approval of necessary governing bodies at subsequent steps of the process.

While the Metro Council endorses the LPA, Replacement Bridge with Light Rail and Tolls, as described in Resolution 08-3960A, the Metro Council simultaneously finds that the following issues will need to be satisfactorily addressed in the upcoming refinement of design, engineering and financial planning:

FORMATION OF A LOCAL OVERSIGHT COMMITTEE TO SUCCEED THE TASK FORCE

The Metro Council concluded on June 5, 2008 through Resolution 08-3938B that further oversight of the project is needed once the Task Force's work is concluded. The Council suggested that the Governors of Oregon and Washington convene such a local oversight group. On June 19, 2008, the Governors issued a joint letter that concluded there is a need to reconvene the CRC Project Sponsor's Council as the oversight committee to succeed the Task Force, including representatives from Washington State Department of Transportation, the Oregon Department of Transportation, cities of Portland and Vancouver, Metro, the Southwest Washington RTC, TriMet and CTRAN. The Governors charged the committee with advising the two departments of transportation and two transit agencies on a consensus basis to the greatest extent possible regarding the major issues requiring further oversight and resolution.

PROJECT ISSUES REQUIRING LOCAL OVERSIGHT DURING PLANNING, DESIGN, ENGINEERING, FINANCE AND CONSTRUCTION

The Governors have charged the Project Sponsors Council with project oversight on the following issues, milestones and decision points:

1) Completion of the Environmental Impact Statement (EIS),
2) Project design, including, but not limited to: examining ways to provide an efficient solution that meets safety, transportation and environmental goals,
3) Timelines associated with project development,
4) Development and use of sustainable construction methods,
5) Ensuring the project is consistent with Oregon and Washington's statutory reduction goals for green house gas emissions, and
6) A finance plan that balances revenue generation and demand management, including the project capital and operating costs, the sources of revenue, impact to the funds required for other potential expenditures in the region.

The Metro Council has identified additional areas of concern that need to be addressed by the Project Sponsors Council as the project moves forward:

A. TOLLING

Implementation of tolls on the existing I-5 Bridge should be undertaken as soon as legally and practically permissible. Consideration should be given to potential diversion of traffic to I-205 and potential tolling I-5 and I-205 with those revenues potentially used for projects on these two facilities in the Portland-Vancouver metropolitan area.

B. NUMBER OF AUXILIARY LANES

Determine the number of auxiliary lanes in addition to the three through lanes in each direction on the replacement bridge across the Columbia River and throughout the bridge influence area.

C. IMPACT MITIGATION AND COMMUNITY ENHANCEMENT

Identify proposed mitigation for any potential adverse human health impacts related to the project and existing human health impacts in the project area, including community enhancement projects that address environmental justice.

D. DEMAND MANAGEMENT

Develop of state-of-the-art demand management techniques in addition to tolls that would influence travel behavior and reduce greenhouse gas emissions.

E. FINANCING PLAN

A detailed financing plan showing costs and sources of revenue must be proposed and presented to the partner agencies and to the public. The proposed financing plan should indicate how the federal, state and local (if any) sources of revenue proposed to be dedicated to this project would impact, or could be compared to, the funds required for other potential expenditures in the region.

F. CAPACITY CONSIDERATIONS, INDUCED DEMAND AND GREENHOUSE GASES

Further analysis is required of the greenhouse gas and induced automobile demand forecasts for this project. The results of the analysis must be prominently displayed in the Final Environmental Impact Statement. The analysis should include comparisons related to the purpose and function of the so-called '"auxiliary" lanes. A reduction in vehicle miles traveled should be pursued to support stated greenhouse gas reduction targets as expressed by legislation in Oregon and Washington and by the Governors.

G. PRESERVATION OF FREIGHT ACCESS

The design and finance phase of the CRC project will need to describe specifically what physical and fiscal (tolling) methods will be employed to ensure that trucks are granted a priority which is commensurate with their contributions to the project and their important role in the economy relative to single-occupancy automobile commuting. Ensure that freight capacity at interchanges is not diminished by industrial land use conversion.

H. LIGHT RAIL

As indicated in the Item 2 "resolved" in the body of the resolution, the Metro Council's endorsement of the LPA categorically stipulates that light rail must be included in any phasing package that may move forward for construction.

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I. DESIGN OF BICYCLE AND PEDESTRIAN FACILITIES
More detailed design of bicycle and pedestrian facilities is required to inform the decisions of the local oversight panel described above. The project should design "world class" bicycle and pedestrian facilities on the replacement bridge, bridge approaches and throughout the bridge influence area that meet or exceed standards and are adequate to meet the demand generated by tolls or other demand management techniques.

J. URBAN DEVELOPMENT IMPACTS AT RE-DESIGNED INTERCHANGES
More design of the interchanges related to the CRC is required to fully evaluate their community impact. The design of interchanges within the bridge influence area must take into account their impact on urban development potential. The Metro Council is also concerned that the Marine Drive access points preserve and improve the functionality of the Expo Center.

K. BRIDGE DESIGN
The bridge type and aesthetics of the final design should be an important consideration in the phase of study that follows approval of the LPA and precedes consideration of the final decision.

Chapter 5, Financial Plan of the Metro 2035 RTP, Federal Component is amended by adding the following new section:

5.3.4 Columbia River Crossing Funding Assumptions

The Columbia River Crossing (CRC) Project is a collaboration of Oregon Department of Transportation, Washington State Department of Transportation, Metro, the Southwest Washington Regional Transportation Council, TriMet and CTRAN as well as the cities of Portland and Vancouver.

The CRC Project is a national transportation priority as it has been designated a "Corridor of the Future" by the Federal Highway Administration (FHWA). The Project will seek FHWA funding from this program category and other appropriate sources. Accordingly, the FHWA has indicated that it is a high priority to address the safety and congestion issues related to the segment of Interstate 5 between Columbia Boulevard north to State Route 500 in Vancouver, Washington.

The Federal Transit Administration (FTA) awards transit capital construction grants on a competitive basis. The CRC project will be submitting an application to the FTA for entry into Preliminary Engineering and eventually for a full funding grant agreement. The Metro region has been highly successful in securing FTA funds and it is considered reasonable, based on early cost-effectiveness rating analyses, that the high capacity transit component of the CRC Project will secure the $750 million in federal transit funding shown in the table below.

In addition, the Governors of Oregon and Washington have stated their commitment to work with their respective state legislatures to provide state funds to add to federal funding.

Also, tolling is another unique source of funding for the project. It would be a substantial transportation demand management tool as well as providing a significant revenue source. The DEIS states that tolls may supply 36 – 49% of the capital revenues for the highway elements of the project.

Finally, the state of Washington has accumulated credits from tolls imposed on other projects in the state that can be used as local match for federal funds. The state has indicated support for using a portion of these credits for the transit component of this project.

These funding sources for the total project may be summarized as follows (all figures in millions of dollars):

Columbia River Crossing – Total Project Costs
(both Oregon and Washington sides)

Costs		Low	High
Highway		$2,773	$2,920
Transit		750	750
	Total	$3,523	$3,670

Revenues		Low	High
Toll Bond Proceeds		$1,070-$1,350	$1,070 - 1,350
Federal Discretionary Highway		400- 600	400 - 600
State Funds		823-1,303	970 - 1,450
New Starts		750	750
Toll Credits		188	188
	Total	$3,523	$3,670

Chapter 7, Implementation of the Metro 2035 Regional Transportation Plan, (Federal Component), Implementation (page 7-34) is amended as follows:

Interstate-5 North (I-84 to Clark County)

This heavily traveled route is the main connection between Portland and Vancouver. The Metro Council has approved a Locally Preferred Alternative for the Columbia River Crossing (CRC) project that creates a multi-modal solution for the Interstate 5 corridor between Oregon to Washington to address the movement of people and freight across the Columbia River. A replacement bridge with three through lanes in each direction, reconstructed interchanges, tolls priced to manage travel demand as well as provide financing of the project construction, operation and maintenance, light rail transit to Vancouver, and bicycle and pedestrian investments have been identified for this corridor. As project details are evaluated and implemented in this corridor, the following shall be brought back to JPACT and the Metro Council for a subsequent RTP amendment for this Project:

- the number and design of auxiliary lanes on the I-5 Columbia River bridge and approaches to the bridge, including analysis of highway capacity and induced demand.

More generally in the I-5 corridor, the region should:

- consider the potential adverse human health impacts related to the project and existing human health impacts in the project area, including community enhancement projects to address environmental justice.

- consider managed lanes

- maintain an acceptable level of access to the central city from Portland neighborhoods and Clark County

- maintain off-peak freight mobility, especially to numerous marine, rail and truck terminals in the area

- consider new arterial connections for freight access between Highway 30, port terminals in Portland and port facilities in Vancouver, Wa.

- maintain an acceptable level of access to freight intermodal facilities and to the Northeast Portland Highway

- construct interchange improvements at Columbia Boulevard to provide freight access to Northeast Portland Highway

- address freight rail network needs

- develop actions to reduce through-traffic on MLK and Interstate to allow main street redevelopment

- provide recommendations to the Bi-State Coordination Committee prior to JPACT and Metro Council consideration of projects that have bi-state significance.

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STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 08-3960B, FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS

Date: June 26, 2008

Prepared by: Richard Brandman
Ross Roberts
Mark Turpel

BACKGROUND

Overview

The Columbia River Crossing (CRC) is a proposed multimodal bridge, transit, highway, bicycle and pedestrian improvement project sponsored by the Oregon and Washington transportation departments in coordination with Metro, TriMet and the City of Portland as well as the Regional Transportation Council of Southwest Washington, CTRAN and the City of Vancouver, Washington. (More detailed project information may be found at: http://www.columbiarivercrossing.org/)

The CRC project is designed to improve mobility and address safety problems along a five-mile corridor between State Route 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River.

The project would be funded by a combination of Federal Transit Administration (FTA) New Starts funding for the transit component, Federal Highway Administration (FHWA) funding for highway, freight, bicycle and pedestrian improvements, with local match being provided by the states of Oregon and Washington through toll credits and other funding. Tolls are also proposed for a new I-5 bridge to pay for a portion of the capital project and manage transportation demand.

Guiding the project is a 39 member CRC Task Force, of which Councilor Burkholder serves as the Metro representative. On June 5, 2008, the Metro Council approved policy guidance for Councilor Burkholder as its CRC Task Force member in the formulation of the draft locally preferred alternative (LPA) (after consideration of public testimony and review of options for a LPA). On June 24, the CRC Task Force approved recommendations for a LPA for the project sponsor agencies (including Metro) consideration.

Accordingly, the attached Resolution No. 08-3960B will provide for Metro Council consideration of:

1) Adoption of a CRC LPA.
2) Amendment of the federal component of the Metro 2035 Regional Transportation Plan (RTP).
3) Statement of additional Metro Council concerns and considerations regarding the Project.

Project History

The CRC Project history began in 1999, with the Bi-State Transportation Committee recommendation that the Portland/Vancouver region initiate a public process to develop a plan for the I-5 Corridor based on four principles:

- Doing nothing in the I-5 Corridor is unacceptable;
- There must be a multi-modal solution in the I-5 Corridor - there is no silver bullet;

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- Transportation funds are limited. Paying for improvements in the I-5 Corridor will require new funds; and,
- The region must consider measures that promote transportation-efficient development.

Accordingly, the twenty-six member I-5 Transportation and Trade Partnership was constituted by Governors Locke and Kitzhaber, including a Metro Council representative.

In June 2002, the Partnership completed a *Strategic Plan* and on November 14, 2002, the Metro Council, through Resolution No. 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, endorsed the *Strategic Plan* recommendations including:

- Three through lanes in each direction on I-5, one of which was to be studied as an High Occupancy Vehicle (HOV) lane, as feasible;
- Phased light rail loop in Clark County in the vicinity of the I-5, SR500/4th Plan and I-205 corridors;
- An additional or replacement bridge for the I-5 crossing of the Columbia River, with up to two additional lanes for merging plus two light rail tracks;
- Interchange improvements and additional auxiliary and/or arterial lanes where needed between SR 500 in Vancouver and Columbia Boulevard in Portland, including a full interchange at Columbia Boulevard;
- Capacity improvements for freight rail;
- Bi-state coordination of land use and management of the transportation system to reduce demand on the freeway and protect corridor improvement;
- Involving communities along the corridor to ensure final project outcomes are equitable and committing to establish a fund for community enhancement;
- Developing additional transportation demand and system strategies to encourage more efficient use of the transportation system.

Several of the recommendations from the Strategic Plan have been completed. For example, construction of the I-5 Delta Park Project has begun.

The I-5 bridge element began in February 2005 with the formation of a 39 member Columbia River Crossing (CRC) Task Force. This Task Force, which includes a Metro Council representative, developed a vision statement, purpose and need statement and screening criteria.

The adopted project purpose is to: 1) improve travel safety and traffic operation on the I-5 crossing of the Columbia River; 2) improve the connectivity, reliability, travel times and operations of public transit in the corridor, 3) improve highway freight mobility and interstate commerce, and 4) improve the river crossing's structural integrity.

More specifically, the following issues concerning the existing conditions were cited as need:

- Safety - the bridge crossing area and approach sections have crash rates more than two times higher than statewide averages for comparable urban highways. Contributing factors are interchanges too closely spaced, weave and merge sections too short contributing to sideswiping accidents, vertical grade changes that restrict sight distance and very narrow shoulders that prevent avoidance maneuvers or safe temporary storage of disabled vehicles.
- Seismic - neither I-5 bridges meet seismic standards, leaving the I-5 corridor vulnerable in the event of a large earthquake;
- Bridge Alignment - the alignment of the I-5 bridges with the downstream railroad bridge contributes to hazardous barge movements;

- Cost - rehabilitation of the existing bridges, bringing them to current standards would be more costly, both in money and some environmental impacts, such as water habitat conditions, than a replacement bridge;
- Traffic Impact - an arterial bridge would bring unacceptable traffic congestion to downtown Vancouver, Washington.

The CRC Project analyzed 37 distinct bridge, transit, highway and transportation demand management modes/designs, which the CRC Task Force narrowed to twelve. These twelve options then received even more analysis.

In November 2007, CRC staff, after further consideration of technical analyses and using the approved screening criteria and project purpose and need, recommended three alternatives be advanced to a draft environmental impact statement (DEIS). These included:

- Alternative 1) No Action;
- Alternative 2) A Replacement Bridge and Bus Rapid Transit with Complementary Express Bus Service; and
- Alternative 3) A Replacement Bridge and Light Rail Transit with Complementary Express Bus Service.

Open houses were held to take public comment about whether these three alternatives should be advanced to analysis in the DEIS. The Metro Council, other project sponsors and some members of the public expressed interest in a less expensive, smaller project alternative. Accordingly, two supplemental bridge alternatives (one with bus rapid transit, the other with light rail transit) were proposed to be added to the alternatives studied in the DEIS.

The Metro Council concurred with these five alternatives in adopting Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," on February 22, 2007.

On December 13, 2007, the Metro Council adopted the federal component of the 2035RTP. The RTP included funds for preliminary engineering and right-of-way purchase in the financially constrained system project list for a new bridge across the Columbia River. This item was reconfirmed with the adoption of the air quality conformity determination in February 2008 that assumed a new bridge with light rail transit to Vancouver.

In a meeting of the CRC Task Force in January 2008, an informal poll was taken that initiated discussion of the LPA. Strong support was found for:

- A replacement bridge with tolls;
- Light rail transit extended to Vancouver, Washington;
- Bicycle and pedestrian path improvements.

(Councilor Burkholder, the Metro Council representative, deferred comment in this survey citing the need to confer with the full Metro Council).

On May 2, 2008, a DEIS addressing the five CRC alternatives was released for a 60-day public comment period. During that time, the CRC project received 1,120 comments on the DEIS. The CRC also held two open houses attended by 425 people and held four question and answer sessions.

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Later in May 2008, review and discussion of the CRC alternatives and the potential benefits and adverse impacts as disclosed in the CRC Draft Environmental Impact Statement were discussed by the Metro Council. After consideration of the CRC documents, Metro Council work session discussions and public testimony received at a Metro Council public hearing June 5, the Metro Council approved policy guidance by adopting Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," on June 5, 2008.

Resolution 08-3938B included the following major points:

- A multimodal approach that includes:
  - light rail transit extended to Vancouver;
  - A replacement bridge with three through lanes in each direction and the number of auxiliary lanes to be determined;
  - Tolls to manage travel demand as well as provide an ongoing funding source for bridge construction, operations and maintenance;
  - Improved bicycle and pedestrian facilities;
  - Compact land use development patterns with a mixture of housing types to minimize long commutes and reduce automobile dependence.
- Recognition that the above elements and others identified in an exhibit to the resolution will need to be satisfactorily addressed as part of the LPA or at later decision points, prior to a final decision.
- Need to address potential and existing health impacts and using a community enhancement fund to address environmental justice.
- Independent analysis of greenhouse gas emissions and whether the project alternatives would help achieve or frustrate greenhouse gas emission reduction goals for 2020 and 2050.
- Charging tolls as soon as legally and practicably possible and use of state-of-the-art demand management tool to influence travel behavior and reduce greenhouse gas emissions and reduce vehicle miles traveled.
- Recognition of the need for the Metro Council to consider an LPA adoption and an RTP amendment and that the two decisions could be made concurrently.

On June 24, 2008, the CRC Task Force, by a vote of 37-2, recommended the following:

- A replacement bridge with three through lanes northbound and southbound.
- Light rail as the preferred high capacity transit mode with an alignment and terminus based on FTA funding, technical considerations and Vancouver City Council and CTRAN votes in early July 2008.
- Formation of a formal oversight committee.
- Continuation of existing advisory committees dealing with freight, pedestrians and bicycles, urban design, community and environmental justice and creation of a new sustainability working group.
- A list of project and regional elements that have not been made final at this time, but which the CRC Project recognizes the need for consideration. (see Attachment 1 to this staff report)

In addition to the Metro Council public hearing on the project on June 5, 2008 and the CRC Task Force hearing on June 24, 2008, there were numerous public meetings, open houses, and mailings regarding the project. Additionally, the LPA and the need for an RTP amendment were discussed at the Transportation Policy Advisory Committee's (TPAC) May 30, 2008 meeting and both the RTP amendment and the LPA resolution were recommended at its June 27, 2008 meeting. The proposed RTP amendments and LPA were also discussed at the Joint Policy Advisory Committee on Transportation's (JPACT) June 12, 2008 meeting and approved at its July 10, 2008 meeting.

This proposed Resolution No. 08-3960B, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions, is generally consistent with the June 24 CRC Task Force recommendations. In addition, proposed Resolution No 08-3960B addresses the following:

1) A list of project concerns to be addressed and resolved (attached as Exhibit A to Resolution No. 08-3960B).
2) Amendment of the 2035 RTP to:
    - revise the Financially Constrained Project List (appendix 1.1);
    - revise the "Other RTP Projects not included in the Financially Constrained list" (appendix 1.2);
    - amend Chapter 5, Financial Plan of the RTP, to include a section on the funding of the CRC project (and included as Exhibit B to Resolution No. 08-3960B);
    - amend Chapter 7, Implementation of the RTP, to revise the description of the I-5 North corridor (and included as Exhibit C to Resolution No. 08-3960B).

(A separate RTP amendment that would revise the state component of the RTP and include land use findings is not proposed at this time and would be addressed once more information and analysis is available concerning auxiliary lanes and other issues identified in Resolution No 08-3960B.)

In addition to these immediate decisions, the following actions will take place in Fall 2008 and beyond include:

- Number of auxiliary travel lanes
- Bridge design details (such as bridge type, whether Stacked Highway/Transit design would work, be cost-effective and whether this aspect of the bridge should be pursued)
- Transportation Demand Management (TDM) specifics
- Interchange design specifics
- Bicycle and pedestrian design details
- More specificity on finance plan

The CRC Task Force's June 24 recommendations to consider a Locally Preferred Alternative (LPA) will also be brought to the cities of Portland and Vancouver, TriMet and CTRAN, and Metro and the Regional Transportation Council of Southwest Washington for adoption and corresponding transportation plan amendments. These actions will allow ODOT and WSDOT to submit to the FTA an application to enter preliminary engineering to prepare a final environmental impact statement (FEIS).

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[1] By July 8, the City of Vancouver and CTRAN are scheduled to conclude the alignment and terminus of the LRT line in Vancouver, Washington. In order to facilitate the bi-state transportation aspects of this draft resolution, these southwest Washington project partner decisions will be provided to the Joint Policy Advisory Committee (JPACT), which meets on July 10 to consider this resolution and to the Metro Council that meets on July 17 also to consider this resolution. Accordingly, draft Metro Resolution No. 08-3960B may be proposed for revision in July as a result.

ANALYSIS/INFORMATION

1. **Known Opposition** The CRC is a very large and complex transportation project. There are strong feelings – pro and con – associated with the project. Opposition to the project includes concerns raised regarding the need for the project, greenhouse gas emissions that could be generated by the project, costs, tolls and light rail extension to Vancouver, Washington.

2. **Legal Antecedents**

Federal

- National Environmental Policy Act
- Clean Air Act
- SAFETEA-LU
- FTA New Starts Process

State

- Statewide Planning Goals
- State Transportation Planning Rule
- Oregon Transportation Plan
- Oregon Highway Plan
- Oregon Public Transportation Plan
- Oregon Bicycle and Pedestrian Plan

Metro

- Resolution No. 02-3237A, "For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations," adopted on November 14, 2002.
- Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," adopted on February 22, 2007.
- Ordinance No. 07-3831B, "For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis," adopted on December 13, 2007.
- Resolution No. 08-3911, "For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program," adopted on February 28, 2008.
- Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," adopted on June 5, 2008.

3. **Anticipated Effects** The approval of this resolution would allow the submission of a New Starts application for light rail transit to Vancouver Washington as well as include proceeding with the next steps towards a replacement bridge with tolls and light rail transit. It would not resolve the number of auxiliary lanes or other issues and considerations listed in the resolution but which will need to be addressed in the future once additional information and analysis is completed.

4. **Budget Impacts** If there is a role for Metro to play in the completion of the CRC Final Environmental Impact Statement (this could be additional updated travel forecasting, for example), the CRC project would reimburse Metro for any costs incurred for such work.

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RECOMMENDED ACTION
Adopt Resolution No. 08-3960B, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions.

Columbia River CROSSING

A RESOLUTION OF THE COLUMBIA RIVER CROSSING TASK FORCE TO PROVIDE DIRECTION TO THE COLUMBIA RIVER CROSSING PROJECT ON KEY DECISIONS FOR A LOCALLY PREFERED ALTERNATIVE

WHEREAS, the I-5 Interstate Bridge is one of only two Columbia River crossings between Vancouver, Washington and Portland, Oregon and approximately 150,000 people rely on crossing the I-5 Bridge daily by car, transit, bicycle and on foot; and

WHEREAS, the existing structures are aging and in need of seismic upgrade, and the closely-spaced interchanges are in need of safety improvements; and

WHEREAS, the movement of land and water-based freight is hindered by the current crossing, and

WHEREAS, high capacity transit does not currently connect Vancouver and Portland, and the bicycle and pedestrian paths do not meet current standards; and

WHEREAS, the I-5 Transportation and Trade Partnership Final Strategic Plan recommended congestion and mobility improvements within the I-5 Bridge Influence Area in 2002; and

WHEREAS, the Columbia River Crossing Task Force was established in February 2005, to advise the Oregon Department of Transportation and the Washington State Department of Transportation on project-related issues and concerns; and

WHEREAS, the Columbia River Crossing Task Force advised development of the project's Vision and Values Statement, alternatives development, and narrowing of the alternatives to five that would be studied in a Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project is committed to implementing the principles of sustainability into project planning, design and construction in order to improve the natural and social environment and the regional economy whenever possible; and to minimize effects related to climate change; and

WHEREAS, the Oregon State Department of Transportation, Washington State Department of Transportation, Metro Council, Southwest Washington Regional Transportation Council, TriMet, C-TRAN, City of Portland and City of Vancouver have worked collaboratively on the development of the Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project published a Draft Environmental Impact Statement on May 2, 2008, disclosing the potential environmental and community impacts and potential mitigation of the five alternatives; and

WHEREAS, the Columbia River Crossing project is seeking public comments on the Draft Environmental Impact Statement from the Columbia River Crossing Task Force as well as the public through outreach events, working sessions and hearings with sponsor agencies, and through two open houses and two public hearings during the comment period; and

WHEREAS, the Columbia River Crossing Task Force has opted to confirm Key Decisions that will lead to selection of a Locally Preferred Alternative.

NOW, THEREFORE, BE IT RESOLVED THAT THE COLUMBIA RIVER CROSSING TASK FORCE MAKES THESE RECOMMENDATIONS TO THE COLUMBIA RIVER CROSSING PROJECT:

1. In regards to the river crossing selection, the CRC Task Force supports the construction of a replacement bridge with three through lanes northbound and southbound as the preferred option.
2. In regards to the high capacity transit selection, the CRC Task Force supports light rail as the preferred mode.

~~3.~~ In regards to the alignment and terminus of the high capacity transit line, and based on the information provided to date, the CRC Task Force

- Recognizes that the selection of the alignment and terminus options should be determined through a combination of:
    - i. Federal New Starts funding eligibility,
    - ii. Public and local stakeholder involvement,
    - iii. CRC project evaluation and technical determination of the terminus that allows for the greatest flexibility for future high capacity transit extensions and connections in Clark County, and
    - iv. Outcome of the Vancouver City Council and C-TRAN votes on July 7 and July 8, respectively.

4. Creation of a formal oversight committee that strives for consensus and provides for a public process of review, deliberation and decision-making for outstanding major project issues and decisions.
5. The Freight Working Group, the Pedestrian and Bicycle Advisory Committee, the Urban Design Advisory Group, the Community and Environmental Justice Group, and the newly formed Sustainability Working Group, shall continue their advisory roles for refinement of the LPA. These advisory groups shall report findings and recommendations to the local oversight committee.

6. The CRC Task Force understands that several project elements have not been finalized at the time of this resolution. These elements will need to be satisfactorily resolved through a process that includes public involvement, recommendations from governing bodies of the sponsor agencies, and recommendations by a local advisory committee. The CRC Task Force supports the consideration of the attached list of Supplemental Positions for Future Project and Regional Consideration.

Columbia River CROSSING

Columbia River Crossing Project
Supplemental Positions for Future Project and Regional Consideration

For Project Consideration:
The Columbia River Crossing Task Force presents these supplemental positions for consideration during the post-Locally Preferred Alternative (LPA) phase of the project development process. The Columbia River Crossing Task Force supports the following in association with the CRC project:

- The continued development of a mitigation plan, including avoidance of adverse impacts
- The continued development of a sustainability plan, including the formation of a sustainability working group
- Further study and analysis to determine the appropriate number of auxiliary lanes, necessary for safety and functionality in the project area, and consistent with minimizing impacts. The project should recognize that auxiliary lanes are for interchange operations, not for enhanced mainline throughput, and design the bridge width accordingly.
- The continued commitment to provide enhancements within potentially impacted communities
- As articulated in the final strategic plan of the I-5 Trade and Transportation Partnership, establish a community enhancement fund for use in the impacted areas of the project; such a fund would be in addition to any impact mitigation costs identified through the Draft EIS and would be modeled on the successfully implemented community enhancement fund of the I-5 Delta Park Project and subsequent Oregon Solutions North Portland Diesel Emissions Reduction Project.
- Continued work to design interchanges in the project area that meet the safety and engineering standards and requirements of the Federal Highway Administration, the departments of transportation for Oregon and Washington and the cities of Portland and Vancouver, in a way that is consistent with minimizing impacts.
- Continued work to ensure that interchanges are freight sensitive and provide enhanced mobility, in a way that is consistent with minimizing impacts.
- Imposing tolls on the existing I-5 bridge as soon as legally and practically permissible to reduce congestion by managing travel demand as well as to provide an ongoing funding source for the project
- A public vote where applicable, regarding the funds required to implement the light rail line
- The development of an aesthetically pleasing, sustainable and cost-efficient river crossing that provides a gateway to Vancouver, Portland and the Northwest

- Designing the project – river crossing, transit, and pedestrian and bicycle facilities – to be a model of sustainable design and construction that serves both the built and natural environment
- The development of light rail stations that meet the highest standards for operations and design. These stations would be designed to be safe and accessible to pedestrians, bicyclists, and people with disabilities.
- Continued development of a "world class" bicycle, pedestrian facility, as well as the consideration for provisions for low-powered vehicles such as scooters, mopeds and neighborhood electric vehicles, as part of the construction of a replacement river crossing
- Ensure that the preferred alternative solves the significant safety, congestion and mobility problems in the project area while meeting regional and statewide goals to reinforce density in the urban core and compact development that is both pedestrian friendly and enhances mobility throughout the project area and the region
- Development of an innovative transportation demand management (TDM) program to encourage more efficient use of limited transportation capacity
- Independent validation of the greenhouse gas and climate change analysis conducted in the Draft Environmental Impact Statement to determine the project's effects on air quality, carbon emissions and vehicle miles traveled per capita
- The inclusion of strategies aimed at reducing greenhouse gases and reducing vehicle miles traveled per capita. The Oregon Global Warming Commission or the Washington Climate Action Team should advise the CRC project on project related aspects that will help achieve both states greenhouse gas reduction goals set for 2020 and 2050.
- The development of a more detailed draft finance plan after the LPA is selected to define the funding and financing sources for this project from federal, state and local resources, while ensuring financial equity locally, within the region, and between the states of Oregon and Washington
- Independent review of the project's feasibility and risks, including the project's relationship to funding other transportation projects in the region
- Continued study of project health impacts such as those identified in the report submitted to the Task Force by the Multnomah County Health Department

For Regional Consideration:
There are system-wide transportation concerns that can only be resolved on a regional level and not by the Columbia River Crossing project. The Columbia River Crossing Task Force supports:

- Revisiting the remaining recommendations outlined in the *Strategic Final Plan* of the I-5 Transportation and Trade Partnership Study, dated September 2002
- Evaluating other bottlenecks within the system (e.g., I-405 / I-5 loop, Rose Quarter, etc.)
- Developing a regional plan for traffic demand management in the bi-state Portland-Vancouver region that promotes a reduction in vehicle miles traveled per capita

- Evaluating the effectiveness of a regional high occupancy vehicle (HOV) system
- Developing a regional plan for freight that considers the work of the I-5 Transportation and Trade Partnership and the CRC project's work with the CRC Freight Working Group
- Developing a web-based transit trip planning resource to plan transit trips in the Portland-Vancouver region

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BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS	))))))	RESOLUTION NO. 08- 3960A Introduced by Councilor Burkholder

WHEREAS, the Oregon and Washington sides of the metropolitan region are linked by critical transportation infrastructure vital to each community along the Columbia River; and,

WHEREAS, the I-5 Interstate bridge is a key transportation link that has national and international importance for freight and auto movement; and,

WHEREAS, the I-5 Interstate bridge carries approximately 130,000 people daily by car, truck, bus, bicycle and on foot; and,

WHEREAS, the CRC Draft Environmental Impact Statement (DEIS) analysis found that the segment of I-5 in the vicinity of the Columbia River has extended peak-hour travel demand that exceeds capacity, includes bridge spans that are over 50 and 90 years old and that do not meet current traffic safety or seismic standards, and,

WHEREAS, techniques to improve peak truck freight movement times along with bridge and highway improvements would help support and improve the economy of the region and beyond; and,

WHEREAS, the greatest inhibition to the predictable flow of truck freight is single-occupancy automobile commuting, and according to the CRC analysis, in the absence of tolling, other demand management, and good public transit service the growth of such automobile commuting will contribute to the costs of truck delay; and,

WHEREAS, travel by transit between Portland and Vancouver currently must share a right-of-way with autos and trucks; and,

WHEREAS, the bicycle and pedestrian facilities for crossing the Columbia River along I-5 do not meet current standards, that demand for such facilities is expected to increase, and that experience on Portland bridges has proven that when safe bicycle facilities are provided, ridership grows dramatically; and,

WHEREAS, the CRC DEIS states that in the absence of tolls, absence of effective high-capacity transit service, and absence of safe bicycle and pedestrian facilities, automobile traffic and its resulting emissions and impact on climate change would continue to grow faster with the "no build" option than such automobile traffic and emissions would grow with the replacement bridge option that does include tolls, effective transit, and safe bicycle and pedestrian facilities; and,

WHEREAS, because of high demand and because only two road crossings of the Columbia River exist in the metropolitan region, the I-5 and I-205 corridor is very well situated for tolling, a revenue source and management tool currently not feasible for many other projects vying for public funds; and,

WHEREAS, consideration should be given to potential diversion of traffic from tolling I-5 alone to I-205 and should consider tolling I-5 and I-205 with use of the revenue for both I-5 and I-205 in the Portland-Vancouver metropolitan area; and,

WHEREAS, the states of Oregon and Washington have both established aggressive climate change strategies that include significant reductions in vehicle miles traveled and/or greenhouse gas emissions during the expected life of a CRC project; and,

WHEREAS, in Washington State the goal is to reduce vehicle miles traveled by 50 percent by 2050 and in Oregon the goal is to reduce greenhouse gas emissions by 75 percent below 1990 levels by 2050; and,

WHEREAS, the Oregon Governor's Climate Change Integration Group in its final report dated January 2008 state that "reducing vehicle miles traveled is the single most effective way to reduce greenhouse gas emissions", and,

WHEREAS, the reduction of greenhouse gas emissions is a regional goal that the Metro Council has directed that methods of decreasing such emissions be identified and pursued; and,

WHEREAS the Metro Council has concurred with the Governor's Climate Change Integration Group that reducing vehicle miles traveled is the single most effective means of reducing greenhouse gas emissions; and,

WHEREAS, high capacity transit, as well as walking and biking reduce vehicle miles travelled and reduce greenhouse gas emissions; and,

WHEREAS, the Metro region and the Federal Transit Administration have made extensive investments in high capacity transit, especially light rail transit, as the preferred high capacity transit mode in most corridors in the region, including the Interstate MAX LRT line to the Expo Center, about 1 mile from Vancouver, Washington and adjacent to Interstate 5; and,

WHEREAS, on November 14, 2002 the Metro Council approved Resolution 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, that supported a multimodal project including light rail transit (LRT) and either a new supplemental or replacement I-5 bridge; and,

WHEREAS, the I-5 Transportation and Trade Study also included recommendations to widen I-5 to three lanes between Delta Park and Lombard, address finance issues, use travel demand tools including pricing (tolls), address environmental justice through use of a community enhancement fund, coordinate land use to avoid adverse impacts to transportation investments and improve heavy rail; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that "all transportation alternatives be evaluated for their land use implications…[because] added lanes of traffic …will have an influence on settlement patterns and development"; and,

WHEREAS, the CRC Task Force's endorsement of a locally preferred alternative is one "narrowing" step in a multi-step process and is an important opportunity for the Metro Council to articulate its concerns which will be weighed at this and subsequent steps; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that Metro "will need to work closely with you as your project proceeds and as the RTP policies are developed to ensure that your proposals are consistent with our new policies."; and,

WHEREAS, the CRC Task Force, a 39 member advisory committee, has met regularly for over two years creating a project purpose and need, evaluation criteria and alternatives; and,

WHEREAS, a draft environmental impact statement has been completed that assesses the potential impacts of the project alternatives including a No Build, replacement and supplemental bridge options and bus rapid transit and light rail transit as well as bicycle and pedestrian facilities; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge and/or rehabilitating and keeping the existing bridges, could improve safety by providing travel lane designs that meet safety standards including improved sight distance, greater lane widths, improved road shoulders and would eliminate bridge lifts which are indirectly a major cause of rear end accidents on and near the bridge; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, would reduce auto and truck delays that result from bridge openings; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, could improve the seismic safety of those crossing the river by auto and truck, reducing the potential for economic disruption as a result of restricted truck freight movement from seismic damage as well as reduce the potential for river navigation hazards created by seismic events; and,

WHEREAS, high capacity transit in an exclusive right-of-way would provide greatly improved transit service with much better schedule reliability and service than mixed-use traffic operation; and,

WHEREAS, LRT would produce higher total transit ridership in the corridor than BRT; and,

WHEREAS, LRT is more cost effective than Bus Rapid Transit (BRT), and is about one-half as expensive to operate per transit rider crossing the river; and,

WHEREAS, the Metro Council held a public hearing about the CRC project alternatives on June 5, 2008 and,

WHEREAS, on June 5, 2008, the Metro Council approved Resolution No. 08-3938B For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project and that the Metro Council concluded in this resolution its support for a Columbia River Crossing (CRC) Project with light rail, a replacement bridge with three through lanes and tolls for travel demand management and ongoing funding but also included substantial conditions; and,

WHEREAS, the CRC Task Force has recommended a locally preferred alternative that includes light rail transit and a replacement bridge; and,

WHEREAS, on December 13, 2007, the Metro Council approved Resolution No. 07-3831B, For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis, and the adopted 2035 Regional Transportation Plan (RTP), Financially Constrained System Project list includes Metro project number 10866, "Improve I-5/Columbia River bridge (Oregon share)" with $74 million year of expenditure reserved for preliminary engineering and right-of-way acquisition, but does not include funds for project construction; and,

WHEREAS, on February 28, 2008, the Metro Council adopted Resolution No. 08-3911, For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program, and this air quality conformity included the CRC project, highway and light rail transit; and,

WHEREAS, the CRC Project is projected to cost between $3.5 and 3.7 billion dollars; and,

WHEREAS, a revenue forecast has been completed using best available information that shows revenue sources that could fund the project; and,

WHEREAS, the Metro 2035 RTP does not currently include a description of the proposed locally preferred alternative for the CRC Project as supported by the Metro Council; and,

WHEREAS, state law provides for land use final order to address meeting the potential land use impacts of light rail and related highway improvements in the South/North corridor of which the I-5 bridge is a part; and,

WHEREAS, at its meeting on July 10, 2008, the Joint Policy Advisory Committee on Transportation recommended approval of the following; now therefore,

BE IT RESOLVED that the Metro Council:

1. Continues to support a balanced multi-modal approach of highway, high capacity transit, freight movement, transportation demand management and bicycle and pedestrian improvements in the Columbia River Crossing corridor, as well as compact land use development patterns with a mixture of uses and types of housing which minimize long commutes and reduce our citizen's automobile dependence.
2. Supports a Columbia River Crossing locally preferred alternative:
    a. a replacement bridge with three northbound and three southbound through lanes, with tolls used both for finance and for demand management, as the preferred river crossing option,
    b. light rail as the preferred high capacity transit option, extending light rail from the Expo Center in Portland, Oregon across Hayden Island adjacent to I-5 to Vancouver, Washington,
    c. a light rail terminus in Vancouver, Washington.
3. Finds that the following concerns and considerations will need to be addressed as described in Exhibit A, attached.
4. Amends the Metro 2035 Regional Transportation Plan, Appendix 1.1, Financially Constrained System, Project Number 10866 to read: "Improve I-5/Columbia River bridge in cooperation with ODOT and WSDOT with light rail transit, reconstructed interchanges and a replacement bridge

with three through lanes in each direction and tolls designed to manage travel demand as well as provide an ongoing funding source for project construction, operations and maintenance." Further, amends the Project amount to read: "A range of between $3.5 and $3.7 billion."

5. Amends the Metro Appendix 1.2, "2035 RTP Other Projects Not Included in the Financially Constrained System", deleting Project number 10893, "Improve I-5/Columbia River bridge (Oregon Share)" and deleting Project number 10902, "CRC – Expo to Vancouver, north on Main to Lincoln", as these projects are now included in the Financially Constrained System.
6. Amends the Metro 2035 RTP, Chapter 5, Financial Plan, by adding Section 5.3.4, CRC Funding Assumptions, attached as Exhibit B.
7. Amends the Metro 2035 RTP, Chapter 7, Implementation, amending Section 7.7.5, Type I- Major Corridor Refinements, Interstate-5 North (I-84 to Clark County) as described in Exhibit C, attached.
8. Defers the determination of the number of auxiliary lanes to a subsequent amendment of the 2035 RTP, based on additional analysis.
9. Acknowledges that a land use final order for addressing land use consistency for the Oregon side of the Project is being prepared and will be submitted to the Council for approval in Fall 2008.

ADOPTED by the Metro Council this ____________________ day of ______________, 2008.

____
David Bragdon, Council President

Approved as to Form:

____
Daniel B. Cooper, Metro Attorney

RESOLUTION 08-3960
Exhibit A

Metro Council Concerns and Considerations
Columbia River Crossing "Locally Preferred Alternative"

The Metro Council recognizes that endorsement of a "Locally Preferred Alternative" is one important narrowing step that enables the project management team to proceed with further analysis of a reduced range of alternatives. The Council is cognizant that many important issues are generally still unresolved at the time of endorsement of an LPA, but that clear articulation of concerns is required to make sure that such unresolved issues are appropriately resolved during the next phase of design, engineering, and financial planning, with proper participation by the local community and its elected representatives. If those sorts of outstanding issues are not satisfactorily resolved during that post-LPA selection phase, then the project risks failing to win the approval of necessary governing bodies at subsequent steps of the process.

While the Metro Council endorses the LPA, Replacement Bridge with Light Rail and Tolls, as described in Resolution 08-3960A, the Metro Council simultaneously finds that the following issues will need to be satisfactorily addressed in the upcoming refinement of design, engineering and financial planning:

FORMATION OF A LOCAL OVERSIGHT COMMITTEE TO SUCCEED THE TASK FORCE

The Metro Council concluded on June 5, 2008 through Resolution 08-3938B that further oversight of the project is needed once the Task Force's work is concluded. The Council suggested that the Governors of Oregon and Washington convene such a local oversight group. On June 19, 2008, the Governors issued a joint letter that concluded there is a need to reconvene the CRC Project Sponsor's Council as the oversight committee to succeed the Task Force, including representatives from Washington State Department of Transportation, the Oregon Department of Transportation, cities of Portland and Vancouver, Metro, the Southwest Washington RTC, TriMet and CTRAN. The Governors charged the committee with advising the two departments of transportation and two transit agencies on a consensus basis to the greatest extent possible regarding the major issues requiring further oversight and resolution.

PROJECT ISSUES REQUIRING LOCAL OVERSIGHT DURING PLANNING, DESIGN, ENGINEERING, FINANCE AND CONSTRUCTION

The Governors have charged the Project Sponsors Council with project oversight on the following issues, milestones and decision points:

1) Completion of the Environmental Impact Statement (EIS),
2) Project design, including, but not limited to: examining ways to provide an efficient solution that meets safety, transportation and environmental goals,
3) Timelines associated with project development,
4) Development and use of sustainable construction methods,
5) Ensuring the project is consistent with Oregon and Washington's statutory reduction goals for green house gas emissions, and
6) A finance plan that balances revenue generation and demand management, including the project capital and operating costs, the sources of revenue, impact to the funds required for other potential expenditures in the region.

The Metro Council has identified additional areas of concern that need to be addressed by the Project Sponsors Council as the project moves forward:

A. TOLLING

Implementation of tolls on the existing I-5 Bridge should be undertaken as soon as legally and practically permissible. Consideration should be given to potential diversion of traffic to I-205 and potential tolling I-5 and I-205 with those revenues potentially used for projects on these two facilities in the Portland-Vancouver metropolitan area.

B. NUMBER OF AUXILIARY LANES

Determine the number of auxiliary lanes in addition to the three through lanes in each direction on the replacement bridge across the Columbia River and throughout the bridge influence area.

C. IMPACT MITIGATION AND COMMUNITY ENHANCEMENT

Identify proposed mitigation for any potential adverse human health impacts related to the project or existing human health impacts in the project area, including community enhancement projects that address environmental justice.

D. DEMAND MANAGEMENT

Develop of state-of-the-art demand management techniques in addition to tolls that would influence travel behavior and reduce greenhouse gas emissions.

E. FINANCING PLAN

A detailed financing plan showing costs and sources of revenue must be proposed and presented to the partner agencies and to the public. The proposed financing plan should indicate how the federal, state and local (if any) sources of revenue proposed to be dedicated to this project would impact, or could be compared to, the funds required for other potential expenditures in the region.

F. CAPACITY CONSIDERATIONS, INDUCED DEMAND AND GREENHOUSE GASES

Further analysis is required of the greenhouse gas and induced automobile demand forecasts for this project. The results of the analysis must be prominently displayed in the Final Environmental Impact Statement. The analysis should include comparisons related to the purpose and function of the so-called '"auxiliary" lanes. A reduction in vehicle miles traveled should be pursued to support stated greenhouse gas reduction targets as expressed by legislation in Oregon and Washington and by the Governors.

G. PRESERVATION OF FREIGHT ACCESS

The design and finance phase of the CRC project will need to describe specifically what physical and fiscal (tolling) methods will be employed to ensure that trucks are granted a priority which is commensurate with their contributions to the project and their important role in the economy relative to single-occupancy automobile commuting. Ensure that freight capacity at interchanges is not diminished by industrial land use conversion.

H. LIGHT RAIL

As indicated in the Item 2 "resolved" in the body of the resolution, the Metro Council's endorsement of the LPA categorically stipulates that light rail must be included in any phasing package that may move forward for construction.

I. DESIGN OF BICYCLE AND PEDESTRIAN FACILITIES

More detailed design of bicycle and pedestrian facilities is required to inform the decisions of the local oversight panel described above. The project should design "world class" bicycle and pedestrian facilities on the replacement bridge, bridge approaches and throughout the bridge influence area that meet or exceed standards and are adequate to meet the demand generated by tolls or other demand management techniques.

J. URBAN DEVELOPMENT IMPACTS AT RE-DESIGNED INTERCHANGES

More design of the interchanges related to the CRC is required to fully evaluate their community impact. The design of interchanges within the bridge influence area must take into account their impact on urban development potential. The Metro Council is also concerned that the Marine Drive access points preserve and improve the functionality of the Expo Center.

K. BRIDGE DESIGN

The bridge type and aesthetics of the final design should be an important consideration in the phase of study that follows approval of the LPA and precedes consideration of the final decision.

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Chapter 5, Financial Plan of the Metro 2035 RTP, Federal Component is amended by adding the following new section:

5.3.4 Columbia River Crossing Funding Assumptions

The Columbia River Crossing (CRC) Project is a collaboration of Oregon Department of Transportation, Washington State Department of Transportation, Metro, the Southwest Washington Regional Transportation Council, TriMet and CTRAN as well as the cities of Portland and Vancouver.

The CRC Project is a national transportation priority as it has been designated a "Corridor of the Future" by the Federal Highway Administration (FHWA). The Project will seek FHWA funding from this program category and other appropriate sources. Accordingly, the FHWA has indicated that it is a high priority to address the safety and congestion issues related to the segment of Interstate 5 between Columbia Boulevard north to State Route 500 in Vancouver, Washington.

The Federal Transit Administration (FTA) awards transit capital construction grants on a competitive basis. The CRC project will be submitting an application to the FTA for entry into Preliminary Engineering and eventually for a full funding grant agreement. The Metro region has been highly successful in securing FTA funds and it is considered reasonable, based on early cost-effectiveness rating analyses, that the high capacity transit component of the CRC Project will secure the $750 million in federal transit funding shown in the table below.

In addition, the Governors of Oregon and Washington have stated their commitment to work with their respective state legislatures to provide state funds to add to federal funding.

Also, tolling is another unique source of funding for the project. It would be a substantial transportation demand management tool as well as providing a significant revenue source. The DEIS states that tolls may supply 36 – 49% of the capital revenues for the highway elements of the project.

Finally, the state of Washington has accumulated credits from tolls imposed on other projects in the state that can be used as local match for federal funds. The state has indicated support for using a portion of these credits for the transit component of this project.

These funding sources for the total project may be summarized as follows (all figures in millions of dollars):

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Columbia River Crossing – Total Project Costs
(both Oregon and Washington sides)

Costs		Low	High
Highway		$2,773	$2,920
Transit		750	750
	Total	$3,523	$3,670

Revenues		Low	High
Toll Bond Proceeds		$1,070-$1,350	$1,070 - 1,350
Federal Discretionary Highway		400- 600	400 - 600
State Funds		823-1,303	970 - 1,450
New Starts		750	750
Toll Credits		188	188
	Total	$3,523	$3,670

Exhibit C to Resolution No. 08-3960A (Track Changes Version)

Chapter 7, Implementation of the Metro 2035 Regional Transportation Plan, (Federal Component), Implementation (page 7-34) is amended as follows:

Interstate-5 North (I-84 to Clark County)

This heavily traveled route is the main connection between Portland and Vancouver. The Metro Council has approved a Locally Preferred Alternative for the Columbia River Crossing ~~project is evaluating the~~(CRC) project that creates a multi-modal ~~alternatives in~~solution for the Interstate 5 corridor between Oregon to Washington to address the movement of people and freight across the Columbia River. A~~number of planned and proposed alternative highway capacity improvements, high capacity,~~replacement bridge with three through lanes in each direction, reconstructed interchanges, tolls priced to manage travel demand as well as provide financing of the project construction, operation and maintenance, light rail transit to Vancouver, and bicycle and pedestrian investments have been identified for this corridor. As ~~improvements~~project details are evaluated and implemented in this corridor, the following ~~design considerations should be addressed:~~shall be brought back to JPACT and the Metro Council for a subsequent RTP amendment for this Project:

• ~~consider HOV lanes and peak period pricing~~

~~• high capacity transit alternatives from Vancouver to the Portland Central City (including light rail transit and express bus), recognizing that high capacity transit, light rail, has been built from the Portland Central City to Expo Center~~

~~• maintain an acceptable level of access to the central city from Portland neighborhoods and Clark County~~

~~• maintain off-peak freight mobility, especially to numerous marine, rail and truck terminals in the area~~ the number and design of auxiliary lanes on the I-5 Columbia River bridge and approaches to the bridge, including analysis of highway capacity and induced demand.

More generally in the I-5 corridor, the region should:

• consider the potential adverse human health impacts related to the project or existing human health impacts in the project area, including community enhancement projects to address environmental justice.

• consider ~~adding reversible express lanes to I-5~~managed lanes

• maintain an acceptable level of access to the central city from Portland neighborhoods and Clark County

• maintain off-peak freight mobility, especially to numerous marine, rail and truck terminals in the area

• consider new arterial connections for freight access between Highway 30, port terminals in Portland and port facilities in Vancouver, Wa.

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• maintain an acceptable level of access to freight intermodal facilities and to the Northeast Portland Highway

• construct interchange improvements at Columbia Boulevard to provide freight access to Northeast Portland Highway

• address freight rail network needs

~~• consider additional Interstate Bridge capacity sufficient to handle project needs~~

• develop actions to reduce through-traffic on MLK and Interstate to allow main street redevelopment

• provide recommendations to the Bi-State Coordination Committee prior to JPACT and Metro Council consideration of projects that have bi-state significance.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 08-3960A, FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS

Date: June 26, 2008

Prepared by: Richard Brandman
Ross Roberts
Mark Turpel

BACKGROUND

Overview

The Columbia River Crossing (CRC) is a proposed multimodal bridge, transit, highway, bicycle and pedestrian improvement project sponsored by the Oregon and Washington transportation departments in coordination with Metro, TriMet and the City of Portland as well as the Regional Transportation Council of Southwest Washington, CTRAN and the City of Vancouver, Washington. (More detailed project information may be found at: http://www.columbiarivercrossing.org/)

The CRC project is designed to improve mobility and address safety problems along a five-mile corridor between State Route 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River.

The project would be funded by a combination of Federal Transit Administration (FTA) New Starts funding for the transit component, Federal Highway Administration (FHWA) funding for highway, freight, bicycle and pedestrian improvements, with local match being provided by the states of Oregon and Washington through toll credits and other funding. Tolls are also proposed for a new I-5 bridge to pay for a portion of the capital project and manage transportation demand.

Guiding the project is a 39 member CRC Task Force, of which Councilor Burkholder serves as the Metro representative. On June 5, 2008, the Metro Council approved policy guidance for Councilor Burkholder as its CRC Task Force member in the formulation of the draft locally preferred alternative (LPA) (after consideration of public testimony and review of options for a LPA). On June 24, the CRC Task Force approved recommendations for a LPA for the project sponsor agencies (including Metro) consideration.

Accordingly, the attached Resolution No. 08-3960A will provide for Metro Council consideration of:

1) Adoption of a CRC LPA.
2) Amendment of the federal component of the Metro 2035 Regional Transportation Plan (RTP).
3) Statement of additional Metro Council concerns and considerations regarding the Project.

Project History

The CRC Project history began in 1999, with the Bi-State Transportation Committee recommendation that the Portland/Vancouver region initiate a public process to develop a plan for the I-5 Corridor based on four principles:

- Doing nothing in the I-5 Corridor is unacceptable;
- There must be a multi-modal solution in the I-5 Corridor - there is no silver bullet;

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- Transportation funds are limited. Paying for improvements in the I-5 Corridor will require new funds; and,
- The region must consider measures that promote transportation-efficient development.

Accordingly, the twenty-six member I-5 Transportation and Trade Partnership was constituted by Governors Locke and Kitzhaber, including a Metro Council representative.

In June 2002, the Partnership completed a *Strategic Plan* and on November 14, 2002, the Metro Council, through Resolution No. 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, endorsed the *Strategic Plan* recommendations including:

- Three through lanes in each direction on I-5, one of which was to be studied as an High Occupancy Vehicle (HOV) lane, as feasible;
- Phased light rail loop in Clark County in the vicinity of the I-5, SR500/4th Plan and I-205 corridors;
- An additional or replacement bridge for the I-5 crossing of the Columbia River, with up to two additional lanes for merging plus two light rail tracks;
- Interchange improvements and additional auxiliary and/or arterial lanes where needed between SR 500 in Vancouver and Columbia Boulevard in Portland, including a full interchange at Columbia Boulevard;
- Capacity improvements for freight rail;
- Bi-state coordination of land use and management of the transportation system to reduce demand on the freeway and protect corridor improvement;
- Involving communities along the corridor to ensure final project outcomes are equitable and committing to establish a fund for community enhancement;
- Developing additional transportation demand and system strategies to encourage more efficient use of the transportation system.

Several of the recommendations from the Strategic Plan have been completed. For example, construction of the I-5 Delta Park Project has begun.

The I-5 bridge element began in February 2005 with the formation of a 39 member Columbia River Crossing (CRC) Task Force. This Task Force, which includes a Metro Council representative, developed a vision statement, purpose and need statement and screening criteria.

The adopted project purpose is to: 1) improve travel safety and traffic operation on the I-5 crossing of the Columbia River; 2) improve the connectivity, reliability, travel times and operations of public transit in the corridor, 3) improve highway freight mobility and interstate commerce, and 4) improve the river crossing's structural integrity.

More specifically, the following issues concerning the existing conditions were cited as need:

- Safety - the bridge crossing area and approach sections have crash rates more than two times higher than statewide averages for comparable urban highways. Contributing factors are interchanges too closely spaced, weave and merge sections too short contributing to sideswiping accidents, vertical grade changes that restrict sight distance and very narrow shoulders that prevent avoidance maneuvers or safe temporary storage of disabled vehicles.
- Seismic - neither I-5 bridges meet seismic standards, leaving the I-5 corridor vulnerable in the event of a large earthquake;
- Bridge Alignment - the alignment of the I-5 bridges with the downstream railroad bridge contributes to hazardous barge movements;

- Cost - rehabilitation of the existing bridges, bringing them to current standards would be more costly, both in money and some environmental impacts, such as water habitat conditions, than a replacement bridge;
- Traffic Impact - an arterial bridge would bring unacceptable traffic congestion to downtown Vancouver, Washington.

The CRC Project analyzed 37 distinct bridge, transit, highway and transportation demand management modes/designs, which the CRC Task Force narrowed to twelve. These twelve options then received even more analysis.

In November 2007, CRC staff, after further consideration of technical analyses and using the approved screening criteria and project purpose and need, recommended three alternatives be advanced to a draft environmental impact statement (DEIS). These included:

- Alternative 1) No Action;
- Alternative 2) A Replacement Bridge and Bus Rapid Transit with Complementary Express Bus Service; and
- Alternative 3) A Replacement Bridge and Light Rail Transit with Complementary Express Bus Service.

Open houses were held to take public comment about whether these three alternatives should be advanced to analysis in the DEIS. The Metro Council, other project sponsors and some members of the public expressed interest in a less expensive, smaller project alternative. Accordingly, two supplemental bridge alternatives (one with bus rapid transit, the other with light rail transit) were proposed to be added to the alternatives studied in the DEIS.

The Metro Council concurred with these five alternatives in adopting Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," on February 22, 2007.

On December 13, 2007, the Metro Council adopted the federal component of the 2035RTP. The RTP included funds for preliminary engineering and right-of-way purchase in the financially constrained system project list for a new bridge across the Columbia River. This item was reconfirmed with the adoption of the air quality conformity determination in February 2008 that assumed a new bridge with light rail transit to Vancouver.

In a meeting of the CRC Task Force in January 2008, an informal poll was taken that initiated discussion of the LPA. Strong support was found for:

- A replacement bridge with tolls;
- Light rail transit extended to Vancouver, Washington;
- Bicycle and pedestrian path improvements.

(Councilor Burkholder, the Metro Council representative, deferred comment in this survey citing the need to confer with the full Metro Council).

On May 2, 2008, a DEIS addressing the five CRC alternatives was released for a 60-day public comment period. During that time, the CRC project received 1,120 comments on the DEIS. The CRC also held two open houses attended by 425 people and held four question and answer sessions.

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Later in May 2008, review and discussion of the CRC alternatives and the potential benefits and adverse impacts as disclosed in the CRC Draft Environmental Impact Statement were discussed by the Metro Council. After consideration of the CRC documents, Metro Council work session discussions and public testimony received at a Metro Council public hearing June 5, the Metro Council approved policy guidance by adopting Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," on June 5, 2008.

Resolution 08-3938B included the following major points:

- A multimodal approach that includes:
  - light rail transit extended to Vancouver;
  - A replacement bridge with three through lanes in each direction and the number of auxiliary lanes to be determined;
  - Tolls to manage travel demand as well as provide an ongoing funding source for bridge construction, operations and maintenance;
  - Improved bicycle and pedestrian facilities;
  - Compact land use development patterns with a mixture of housing types to minimize long commutes and reduce automobile dependence.
- Recognition that the above elements and others identified in an exhibit to the resolution will need to be satisfactorily addressed as part of the LPA or at later decision points, prior to a final decision.
- Need to address potential and existing health impacts and using a community enhancement fund to address environmental justice.
- Independent analysis of greenhouse gas emissions and whether the project alternatives would help achieve or frustrate greenhouse gas emission reduction goals for 2020 and 2050.
- Charging tolls as soon as legally and practicably possible and use of state-of-the-art demand management tool to influence travel behavior and reduce greenhouse gas emissions and reduce vehicle miles traveled.
- Recognition of the need for the Metro Council to consider an LPA adoption and an RTP amendment and that the two decisions could be made concurrently.

On June 24, 2008, the CRC Task Force, by a vote of 37-2, recommended the following:

- A replacement bridge with three through lanes northbound and southbound.
- Light rail as the preferred high capacity transit mode with an alignment and terminus based on FTA funding, technical considerations and Vancouver City Council and CTRAN votes in early July 2008.
- Formation of a formal oversight committee.
- Continuation of existing advisory committees dealing with freight, pedestrians and bicycles, urban design, community and environmental justice and creation of a new sustainability working group.
- A list of project and regional elements that have not been made final at this time, but which the CRC Project recognizes the need for consideration. (see Attachment 1 to this staff report)

In addition to the Metro Council public hearing on the project on June 5, 2008 and the CRC Task Force hearing on June 24, 2008, there were numerous public meetings, open houses, and mailings regarding the project. Additionally, the LPA and the need for an RTP amendment were discussed at the Transportation Policy Advisory Committee's (TPAC) May 30, 2008 meeting and both the RTP amendment and the LPA resolution were recommended at its June 27, 2008 meeting. The proposed RTP amendments and LPA were also discussed at the Joint Policy Advisory Committee on Transportation's (JPACT) June 12, 2008 meeting and approved at its July 10, 2008 meeting.

This proposed Resolution No. 08-3960A, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions, is generally consistent with the June 24 CRC Task Force recommendations. In addition, proposed Resolution No 08-3960A addresses the following:

1) A list of project concerns to be addressed and resolved (attached as Exhibit A to Resolution No. 08-3960A).
2) Amendment of the 2035 RTP to:
    - revise the Financially Constrained Project List (appendix 1.1);
    - revise the "Other RTP Projects not included in the Financially Constrained list" (appendix 1.2);
    - amend Chapter 5, Financial Plan of the RTP, to include a section on the funding of the CRC project (and included as Exhibit B to Resolution No. 08-3960A);
    - amend Chapter 7, Implementation of the RTP, to revise the description of the I-5 North corridor (and included as Exhibit C to Resolution No. 08-3960A).

(A separate RTP amendment that would revise the state component of the RTP and include land use findings is not proposed at this time and would be addressed once more information and analysis is available concerning auxiliary lanes and other issues identified in Resolution No 08-3960A.)

In addition to these immediate decisions, the following actions will take place in Fall 2008 and beyond include:

- Number of auxiliary travel lanes
- Bridge design details (such as bridge type, whether Stacked Highway/Transit design would work, be cost-effective and whether this aspect of the bridge should be pursued)
- Transportation Demand Management (TDM) specifics
- Interchange design specifics
- Bicycle and pedestrian design details
- More specificity on finance plan

The CRC Task Force's June 24 recommendations to consider a Locally Preferred Alternative (LPA) will also be brought to the cities of Portland and Vancouver, TriMet and CTRAN, and Metro and the Regional Transportation Council of Southwest Washington for adoption and corresponding transportation plan amendments. These actions will allow ODOT and WSDOT to submit to the FTA an application to enter preliminary engineering to prepare a final environmental impact statement (FEIS).

[1] By July 8, the City of Vancouver and CTRAN are scheduled to conclude the alignment and terminus of the LRT line in Vancouver, Washington. In order to facilitate the bi-state transportation aspects of this draft resolution, these southwest Washington project partner decisions will be provided to the Joint Policy Advisory Committee (JPACT), which meets on July 10 to consider this resolution and to the Metro Council that meets on July 17 also to consider this resolution. Accordingly, draft Metro Resolution No. 08-3960A may be proposed for revision in July as a result.

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ANALYSIS/INFORMATION

1. **Known Opposition** The CRC is a very large and complex transportation project. There are strong feelings – pro and con – associated with the project. Opposition to the project includes concerns raised regarding the need for the project, greenhouse gas emissions that could be generated by the project, costs, tolls and light rail extension to Vancouver, Washington.

2. **Legal Antecedents**

Federal
- National Environmental Policy Act
- Clean Air Act
- SAFETEA-LU
- FTA New Starts Process

State
- Statewide Planning Goals
- State Transportation Planning Rule
- Oregon Transportation Plan
- Oregon Highway Plan
- Oregon Public Transportation Plan
- Oregon Bicycle and Pedestrian Plan

Metro
- Resolution No. 02-3237A, "For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations," adopted on November 14, 2002.
- Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," adopted on February 22, 2007.
- Ordinance No. 07-3831B, "For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis," adopted on December 13, 2007.
- Resolution No. 08-3911, "For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program," adopted on February 28, 2008.
- Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," adopted on June 5, 2008.

3. **Anticipated Effects** The approval of this resolution would allow the submission of a New Starts application for light rail transit to Vancouver Washington as well as include proceeding with the next steps towards a replacement bridge with tolls and light rail transit. It would not resolve the number of auxiliary lanes or other issues and considerations listed in the resolution but which will need to be addressed in the future once additional information and analysis is completed.

4. **Budget Impacts** If there is a role for Metro to play in the completion of the CRC Final Environmental Impact Statement (this could be additional updated travel forecasting, for example), the CRC project would reimburse Metro for any costs incurred for such work.

RECOMMENDED ACTION
Adopt Resolution No. 08-3960A, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions.

FINAL RESOLUTION: 6/24/08

Columbia River
CROSSING

A RESOLUTION OF THE COLUMBIA RIVER CROSSING TASK FORCE TO PROVIDE DIRECTION TO THE COLUMBIA RIVER CROSSING PROJECT ON KEY DECISIONS FOR A LOCALLY PREFERED ALTERNATIVE

WHEREAS, the I-5 Interstate Bridge is one of only two Columbia River crossings between Vancouver, Washington and Portland, Oregon and approximately 150,000 people rely on crossing the I-5 Bridge daily by car, transit, bicycle and on foot; and

WHEREAS, the existing structures are aging and in need of seismic upgrade, and the closely-spaced interchanges are in need of safety improvements; and

WHEREAS, the movement of land and water-based freight is hindered by the current crossing, and

WHEREAS, high capacity transit does not currently connect Vancouver and Portland, and the bicycle and pedestrian paths do not meet current standards; and

WHEREAS, the I-5 Transportation and Trade Partnership Final Strategic Plan recommended congestion and mobility improvements within the I-5 Bridge Influence Area in 2002; and

WHEREAS, the Columbia River Crossing Task Force was established in February 2005, to advise the Oregon Department of Transportation and the Washington State Department of Transportation on project-related issues and concerns; and

WHEREAS, the Columbia River Crossing Task Force advised development of the project's Vision and Values Statement, alternatives development, and narrowing of the alternatives to five that would be studied in a Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project is committed to implementing the principles of sustainability into project planning, design and construction in order to improve the natural and social environment and the regional economy whenever possible; and to minimize effects related to climate change; and

WHEREAS, the Oregon State Department of Transportation, Washington State Department of Transportation, Metro Council, Southwest Washington Regional Transportation Council, TriMet, C-TRAN, City of Portland and City of Vancouver have worked collaboratively on the development of the Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project published a Draft Environmental Impact Statement on May 2, 2008, disclosing the potential environmental and community impacts and potential mitigation of the five alternatives; and

WHEREAS, the Columbia River Crossing project is seeking public comments on the Draft Environmental Impact Statement from the Columbia River Crossing Task Force as well as the public through outreach events, working sessions and hearings with sponsor agencies, and through two open houses and two public hearings during the comment period; and

WHEREAS, the Columbia River Crossing Task Force has opted to confirm Key Decisions that will lead to selection of a Locally Preferred Alternative.

NOW, THEREFORE, BE IT RESOLVED THAT THE COLUMBIA RIVER CROSSING TASK FORCE MAKES THESE RECOMMENDATIONS TO THE COLUMBIA RIVER CROSSING PROJECT:

1. In regards to the river crossing selection, the CRC Task Force supports the construction of a replacement bridge with three through lanes northbound and southbound as the preferred option.
2. In regards to the high capacity transit selection, the CRC Task Force supports light rail as the preferred mode.
3. ~~3.~~ In regards to the alignment and terminus of the high capacity transit line, and based on the information provided to date, the CRC Task Force
    - Recognizes that the selection of the alignment and terminus options should be determined through a combination of:
        i. Federal New Starts funding eligibility,
        ii. Public and local stakeholder involvement,
        iii. CRC project evaluation and technical determination of the terminus that allows for the greatest flexibility for future high capacity transit extensions and connections in Clark County, and
        iv. Outcome of the Vancouver City Council and C-TRAN votes on July 7 and July 8, respectively.
4. Creation of a formal oversight committee that strives for consensus and provides for a public process of review, deliberation and decision-making for outstanding major project issues and decisions.
5. The Freight Working Group, the Pedestrian and Bicycle Advisory Committee, the Urban Design Advisory Group, the Community and Environmental Justice Group, and the newly formed Sustainability Working Group, shall continue their advisory roles for refinement of the LPA. These advisory groups shall report findings and recommendations to the local oversight committee.

6. The CRC Task Force understands that several project elements have not been finalized at the time of this resolution. These elements will need to be satisfactorily resolved through a process that includes public involvement, recommendations from governing bodies of the sponsor agencies, and recommendations by a local advisory committee. The CRC Task Force supports the consideration of the attached list of Supplemental Positions for Future Project and Regional Consideration.

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Columbia River
CROSSING

Columbia River Crossing Project
Supplemental Positions for Future Project and Regional Consideration

For Project Consideration:
The Columbia River Crossing Task Force presents these supplemental positions for consideration during the post-Locally Preferred Alternative (LPA) phase of the project development process. The Columbia River Crossing Task Force supports the following in association with the CRC project:

- The continued development of a mitigation plan, including avoidance of adverse impacts
- The continued development of a sustainability plan, including the formation of a sustainability working group
- Further study and analysis to determine the appropriate number of auxiliary lanes, necessary for safety and functionality in the project area, and consistent with minimizing impacts. The project should recognize that auxiliary lanes are for interchange operations, not for enhanced mainline throughput, and design the bridge width accordingly.
- The continued commitment to provide enhancements within potentially impacted communities
- As articulated in the final strategic plan of the I-5 Trade and Transportation Partnership, establish a community enhancement fund for use in the impacted areas of the project; such a fund would be in addition to any impact mitigation costs identified through the Draft EIS and would be modeled on the successfully implemented community enhancement fund of the I-5 Delta Park Project and subsequent Oregon Solutions North Portland Diesel Emissions Reduction Project.
- Continued work to design interchanges in the project area that meet the safety and engineering standards and requirements of the Federal Highway Administration, the departments of transportation for Oregon and Washington and the cities of Portland and Vancouver, in a way that is consistent with minimizing impacts.
- Continued work to ensure that interchanges are freight sensitive and provide enhanced mobility, in a way that is consistent with minimizing impacts.
- Imposing tolls on the existing I-5 bridge as soon as legally and practically permissible to reduce congestion by managing travel demand as well as to provide an ongoing funding source for the project
- A public vote where applicable, regarding the funds required to implement the light rail line
- The development of an aesthetically pleasing, sustainable and cost-efficient river crossing that provides a gateway to Vancouver, Portland and the Northwest

- Designing the project – river crossing, transit, and pedestrian and bicycle facilities – to be a model of sustainable design and construction that serves both the built and natural environment
- The development of light rail stations that meet the highest standards for operations and design. These stations would be designed to be safe and accessible to pedestrians, bicyclists, and people with disabilities.
- Continued development of a "world class" bicycle, pedestrian facility, as well as the consideration for provisions for low-powered vehicles such as scooters, mopeds and neighborhood electric vehicles, as part of the construction of a replacement river crossing
- Ensure that the preferred alternative solves the significant safety, congestion and mobility problems in the project area while meeting regional and statewide goals to reinforce density in the urban core and compact development that is both pedestrian friendly and enhances mobility throughout the project area and the region
- Development of an innovative transportation demand management (TDM) program to encourage more efficient use of limited transportation capacity
- Independent validation of the greenhouse gas and climate change analysis conducted in the Draft Environmental Impact Statement to determine the project's effects on air quality, carbon emissions and vehicle miles traveled per capita
- The inclusion of strategies aimed at reducing greenhouse gases and reducing vehicle miles traveled per capita. The Oregon Global Warming Commission or the Washington Climate Action Team should advise the CRC project on project related aspects that will help achieve both states greenhouse gas reduction goals set for 2020 and 2050.
- The development of a more detailed draft finance plan after the LPA is selected to define the funding and financing sources for this project from federal, state and local resources, while ensuring financial equity locally, within the region, and between the states of Oregon and Washington
- Independent review of the project's feasibility and risks, including the project's relationship to funding other transportation projects in the region
- Continued study of project health impacts such as those identified in the report submitted to the Task Force by the Multnomah County Health Department

For Regional Consideration:
There are system-wide transportation concerns that can only be resolved on a regional level and not by the Columbia River Crossing project. The Columbia River Crossing Task Force supports:

- Revisiting the remaining recommendations outlined in the *Strategic Final Plan* of the I-5 Transportation and Trade Partnership Study, dated September 2002
- Evaluating other bottlenecks within the system (e.g., I-405 / I-5 loop, Rose Quarter, etc.)
- Developing a regional plan for traffic demand management in the bi-state Portland-Vancouver region that promotes a reduction in vehicle miles traveled per capita

- Evaluating the effectiveness of a regional high occupancy vehicle (HOV) system
- Developing a regional plan for freight that considers the work of the I-5 Transportation and Trade Partnership and the CRC project's work with the CRC Freight Working Group
- Developing a web-based transit trip planning resource to plan transit trips in the Portland-Vancouver region

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BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS	))))))	RESOLUTION NO. 08- 3960 Introduced by Councilor Burkholder

WHEREAS, the Oregon and Washington sides of the metropolitan region are linked by critical transportation infrastructure vital to each community along the Columbia River; and,

WHEREAS, the I-5 Interstate bridge is a key transportation link that has national and international importance for freight and auto movement; and,

WHEREAS, the I-5 Interstate bridge carries approximately 130,000 people daily by car, truck, bus, bicycle and on foot; and,

WHEREAS, the CRC Draft Environmental Impact Statement (DEIS) analysis found that the segment of I-5 in the vicinity of the Columbia River has extended peak-hour travel demand that exceeds capacity, includes bridge spans that are over 50 and 90 years old and that do not meet current traffic safety or seismic standards, and,

WHEREAS, techniques to improve peak truck freight movement times along with bridge and highway improvements would help support and improve the economy of the region and beyond; and,

WHEREAS, the greatest inhibition to the predictable flow of truck freight is single-occupancy automobile commuting, and according to the CRC analysis, in the absence of tolling, other demand management, and good public transit service the growth of such automobile commuting will contribute to the costs of truck delay; and,

WHEREAS, travel by transit between Portland and Vancouver currently must share a right-of-way with autos and trucks; and,

WHEREAS, the bicycle and pedestrian facilities for crossing the Columbia River along I-5 do not meet current standards, that demand for such facilities is expected to increase, and that experience on Portland bridges has proven that when safe bicycle facilities are provided, ridership grows dramatically; and,

WHEREAS, the CRC DEIS states that in the absence of tolls, absence of effective high-capacity transit service, and absence of safe bicycle and pedestrian facilities, automobile traffic and its resulting emissions and impact on climate change would continue to grow faster with the "no build" option than such automobile traffic and emissions would grow with the replacement bridge option that does include tolls, effective transit, and safe bicycle and pedestrian facilities; and,

WHEREAS, because of high demand and because only two road crossings of the Columbia River exist in the metropolitan region, the I-5 and I-205 corridor is very well situated for tolling, a revenue source and management tool currently not feasible for many other projects vying for public funds; and,

WHEREAS, the states of Oregon and Washington have both established aggressive climate change strategies that include significant reductions in vehicle miles traveled and/or greenhouse gas emissions during the expected life of a CRC project; and,

WHEREAS, in Washington State the goal is to reduce vehicle miles traveled by 50 percent by 2050 and in Oregon the goal is to reduce greenhouse gas emissions by 75 percent below 1990 levels by 2050; and,

WHEREAS, the Oregon Governor's Climate Change Integration Group in its final report dated January 2008 state that "reducing vehicle miles traveled is the single most effective way to reduce greenhouse gas emissions", and,

WHEREAS, the reduction of greenhouse gas emissions is a regional goal that the Metro Council has directed that methods of decreasing such emissions be identified and pursued; and,

WHEREAS the Metro Council has concurred with the Governor's Climate Change Integration Group that reducing vehicle miles traveled is the single most effective means of reducing greenhouse gas emissions; and,

WHEREAS, high capacity transit, as well as walking and biking reduce vehicle miles travelled and reduce greenhouse gas emissions; and,

WHEREAS, the Metro region and the Federal Transit Administration have made extensive investments in high capacity transit, especially light rail transit, as the preferred high capacity transit mode in most corridors in the region, including the Interstate MAX LRT line to the Expo Center, about 1 mile from Vancouver, Washington and adjacent to Interstate 5; and,

WHEREAS, on November 14, 2002 the Metro Council approved Resolution 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, that supported a multimodal project including light rail transit (LRT) and either a new supplemental or replacement I-5 bridge; and,

WHEREAS, the I-5 Transportation and Trade Study also included recommendations to widen I-5 to three lanes between Delta Park and Lombard, address finance issues, use travel demand tools including pricing (tolls), address environmental justice through use of a community enhancement fund, coordinate land use to avoid adverse impacts to transportation investments and improve heavy rail; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that "all transportation alternatives be evaluated for their land use implications...[because] added lanes of traffic ...will have an influence on settlement patterns and development"; and,

WHEREAS, the CRC Task Force's endorsement of a locally preferred alternative is one "narrowing" step in a multi-step process and is an important opportunity for the Metro Council to articulate its concerns which will be weighed at this and subsequent steps; and,

WHEREAS, in its October 19, 2006 letter to the CRC Task Force, the Council stated that Metro "will need to work closely with you as your project proceeds and as the RTP policies are developed to ensure that your proposals are consistent with our new policies."; and,

WHEREAS, the CRC Task Force, a 39 member advisory committee, has met regularly for over two years creating a project purpose and need, evaluation criteria and alternatives; and,

WHEREAS, a draft environmental impact statement has been completed that assesses the potential impacts of the project alternatives including a No Build, replacement and supplemental bridge options and bus rapid transit and light rail transit as well as bicycle and pedestrian facilities; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge and/or rehabilitating and keeping the existing bridges, could improve safety by providing travel lane designs that meet safety standards including improved sight distance, greater lane widths, improved road shoulders and would eliminate bridge lifts which are indirectly a major cause of rear end accidents on and near the bridge; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, would reduce auto and truck delays that result from bridge openings; and,

WHEREAS, a Replacement Bridge, unlike a Supplemental Bridge, could improve the seismic safety of those crossing the river by auto and truck, reducing the potential for economic disruption as a result of restricted truck freight movement from seismic damage as well as reduce the potential for river navigation hazards created by seismic events; and,

WHEREAS, high capacity transit in an exclusive right-of-way would provide greatly improved transit service with much better schedule reliability and service than mixed-use traffic operation; and,

WHEREAS, LRT would produce higher total transit ridership in the corridor than BRT; and,

WHEREAS, LRT is more cost effective than Bus Rapid Transit (BRT), and is about one-half as expensive to operate per transit rider crossing the river; and,

WHEREAS, the Metro Council held a public hearing about the CRC project alternatives on June 5, 2008 and,

WHEREAS, on June 5, 2008, the Metro Council approved Resolution No. 08-3938B For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project and that the Metro Council concluded in this resolution its support for a Columbia River Crossing (CRC) Project with light rail, a replacement bridge with three through lanes and tolls for travel demand management and ongoing funding but also included substantial conditions; and,

WHEREAS, the CRC Task Force has recommended a locally preferred alternative that includes light rail transit and a replacement bridge; and,

WHEREAS, on December 13, 2007, the Metro Council approved Resolution No. 07-3831B, For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis, and the adopted 2035 Regional Transportation Plan (RTP), Financially Constrained System Project list includes Metro project number 10866, "Improve I-5/Columbia River bridge (Oregon share)" with $74 million year of expenditure reserved for preliminary engineering and right-of-way acquisition, but does not include funds for project construction; and,

WHEREAS, on February 28, 2008, the Metro Council adopted Resolution No. 08-3911, For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program, and this air quality conformity included the CRC project, highway and light rail transit; and,

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WHEREAS, the CRC Project is projected to cost between $3.5 and 3.7 billion dollars; and,

WHEREAS, a revenue forecast has been completed using best available information that shows revenue sources that could fund the project; and,

WHEREAS, the Metro 2035 RTP does not currently include a description of the proposed locally preferred alternative for the CRC Project as supported by the Metro Council; and,

WHEREAS, state law provides for land use final order to address meeting the potential land use impacts of light rail and related highway improvements in the South/North corridor of which the I-5 bridge is a part; and,

WHEREAS, at its meeting on _________, the Joint Policy Advisory Committee on Transportation recommended approval of the following; now therefore,

BE IT RESOLVED that the Metro Council:

1. Continues to support a balanced multi-modal approach of highway, high capacity transit, freight movement, transportation demand management and bicycle and pedestrian improvements in the Columbia River Crossing corridor, as well as compact land use development patterns with a mixture of uses and types of housing which minimize long commutes and reduce our citizen's automobile dependence.
2. Supports a Columbia River Crossing locally preferred alternative:
   a. a replacement bridge with three northbound and three southbound through lanes, with tolls, as the preferred river crossing option,
   b. light rail as the preferred high capacity transit option, extending light rail from the Expo Center in Portland, Oregon across Hayden Island adjacent to I-5 to Vancouver, Washington
   c. a light rail terminus in Vancouver, Washington.
3. Finds that the following concerns and considerations will need to be addressed as described in Exhibit A, attached.
4. Amends the Metro 2035 Regional Transportation Plan, Appendix 1.1, Financially Constrained System, Project Number 10866 to read: "Improve I-5/Columbia River bridge in cooperation with ODOT and WSDOT with light rail transit, reconstructed interchanges and a replacement bridge with three through lanes in each direction and tolls designed to manage travel demand as well as provide an ongoing funding source for project construction, operations and maintenance." Further, amends the Project amount to read: "A range of between $3.5 and $3.7 billion."
5. Amends the Metro Appendix 1.2, "2035 RTP Other Projects Not Included in the Financially Constrained System", deleting Project number 10893, "Improve I-5/Columbia River bridge

(Oregon Share)" and deleting Project number 10902, "CRC – Expo to Vancouver, north on Main to Lincoln", as these projects are now included in the Financially Constrained System.

6. Amends the Metro 2035 RTP, Chapter 5, Financial Plan, by adding Section 5.3.4, CRC Funding Assumptions, attached as Exhibit B.
7. Amends the Metro 2035 RTP, Chapter 7, Implementation, amending Section 7.7.5, Type I- Major Corridor Refinements, Interstate-5 North (I-84 to Clark County) as described in Exhibit C, attached.
8. Defers the determination of the number of auxiliary lanes to a subsequent amendment of the 2035 RTP, based on additional analysis.
9. Acknowledges that a land use final order for addressing land use consistency for the Oregon side of the Project is being prepared and will be submitted to the Council for approval in Fall 2008.

ADOPTED by the Metro Council this ____________________ day of ______________, 2008.

____
David Bragdon, Council President

Approved as to Form:

____
Daniel B. Cooper, Metro Attorney

RESOLUTION 08-3960
Exhibit A

Metro Council Concerns and Considerations
Columbia River Crossing "Locally Preferred Alternative"

The Metro Council recognizes that endorsement of a "Locally Preferred Alternative" is one important narrowing step that enables the project management team to proceed with further analysis of a reduced range of alternatives. The Council is cognizant that many important issues are generally still unresolved at the time of endorsement of an LPA, but that clear articulation of concerns is required to make sure that such unresolved issues are appropriately resolved during the next phase of design, engineering, and financial planning, with proper participation by the local community and its elected representatives. If those sorts of outstanding issues are not satisfactorily resolved during that post-LPA selection phase, then the project risks failing to win the approval of necessary governing bodies at subsequent steps of the process.

While the Metro Council endorses the LPA, Replacement Bridge with Light Rail and Tolls, as described in Resolution 08-3960, the Metro Council simultaneously finds that the following issues will need to be satisfactorily addressed in the upcoming refinement of design, engineering and financial planning:

FORMATION OF A LOCAL OVERSIGHT COMMITTEE TO SUCCEED THE TASK FORCE

The Metro Council concluded on June 5, 2008 through Resolution 08-3938B that further oversight of the project is needed once the Task Force's work is concluded. The Council suggested that the Governors of Oregon and Washington convene such a local oversight group. On June 19, 2008, the Governors issued a joint letter that concluded there is a need to reconvene the CRC Project Sponsor's Council as the oversight committee to succeed the Task Force, including representatives from Washington State Department of Transportation, the Oregon Department of Transportation, cities of Portland and Vancouver, Metro, the Southwest Washington RTC, TriMet and CTRAN. The Governors charged the committee with advising the two departments of transportation and two transit agencies on a consensus basis to the greatest extent possible regarding the major issues requiring further oversight and resolution.

PROJECT ISSUES REQUIRING LOCAL OVERSIGHT DURING PLANNING, DESIGN, ENGINEERING, FINANCE AND CONSTRUCTION

The Governors have charged the Project Sponsors Council with project oversight on the following issues, milestones and decision points:

1) Completion of the Environmental Impact Statement (EIS),
2) Project design, including, but not limited to: examining ways to provide an efficient solution that meets safety, transportation and environmental goals,
3) Timelines associated with project development,
4) Development and use of sustainable construction methods,
5) Ensuring the project is consistent with Oregon and Washington's statutory reduction goals for green house gas emissions, and
6) A finance plan that balances revenue generation and demand management, including the project capital and operating costs, the sources of revenue, impact to the funds required for other potential expenditures in the region.

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The Metro Council has identified additional areas of concern that need to be addressed by the Project Sponsors Council as the project moves forward:

A. TOLLING
Implementation of tolls on the existing I-5 Bridge should be undertaken as soon as legally and practically permissible.

B. NUMBER OF AUXILIARY LANES
Determine the number of auxiliary lanes in addition to the three through lanes in each direction on the replacement bridge across the Columbia River and throughout the bridge influence area.

C. IMPACT MITIGATION AND COMMUNITY ENHANCEMENT
Identify proposed mitigation for any potential adverse human health impacts related to the project or existing human health impacts in the project area, including community enhancement projects that address environmental justice.

D. DEMAND MANAGEMENT
Develop of state-of-the-art demand management techniques in addition to tolls that would influence travel behavior and reduce greenhouse gas emissions.

E. FINANCING PLAN
A detailed financing plan showing costs and sources of revenue must be proposed and presented to the partner agencies and to the public. The proposed financing plan should indicate how the federal, state and local (if any) sources of revenue proposed to be dedicated to this project would impact, or could be compared to, the funds required for other potential expenditures in the region.

F. CAPACITY CONSIDERATIONS, INDUCED DEMAND AND GREENHOUSE GASES
Further analysis is required of the greenhouse gas and induced automobile demand forecasts for this project. The results of the analysis must be prominently displayed in the Final Environmental Impact Statement. The analysis should include comparisons related to the purpose and function of the so-called '"auxiliary" lanes. A reduction in vehicle miles traveled should be pursued to support stated greenhouse gas reduction targets as expressed by legislation in Oregon and Washington and by the Governors.

G. PRESERVATION OF FREIGHT ACCESS
The design and finance phase of the CRC project will need to describe specifically what physical and fiscal (tolling) methods will be employed to ensure that trucks are granted a priority which is commensurate with their contributions to the project and their important role in the economy relative to single-occupancy automobile commuting. Ensure that freight capacity at interchanges is not diminished by industrial land use conversion.

H. LIGHT RAIL
As indicated in the Item 2 "resolved" in the body of the resolution, the Metro Council's endorsement of the LPA categorically stipulates that light rail must be included in any phasing package that may move forward for construction.

I. DESIGN OF BICYCLE AND PEDESTRIAN FACILITIES
More detailed design of bicycle and pedestrian facilities is required to inform the decisions of the local oversight panel described above. The project should design "world class" bicycle and pedestrian facilities on the replacement bridge, bridge approaches and throughout the bridge influence area that meet or exceed standards and are adequate to meet the demand generated by tolls or other demand management techniques.

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J. URBAN DEVELOPMENT IMPACTS AT RE-DESIGNED INTERCHANGES

More design of the interchanges related to the CRC is required to fully evaluate their community impact. The design of interchanges within the bridge influence area must take into account their impact on urban development potential. The Metro Council is also concerned that the Marine Drive access points preserve and improve the functionality of the Expo Center.

K. BRIDGE DESIGN

The bridge type and aesthetics of the final design should be an important consideration in the phase of study that follows approval of the LPA and precedes consideration of the final decision.

Chapter 5, Financial Plan of the Metro 2035 RTP, Federal Component is amended by adding the following new section:

5.3.4 Columbia River Crossing Funding Assumptions

The Columbia River Crossing (CRC) Project is a collaboration of Oregon Department of Transportation, Washington State Department of Transportation, Metro, the Southwest Washington Regional Transportation Council, TriMet and CTRAN as well as the cities of Portland and Vancouver.

The CRC Project is a national transportation priority as it has been designated a "Corridor of the Future" by the Federal Highway Administration (FHWA). The Project will seek FHWA funding from this program category and other appropriate sources. Accordingly, the FHWA has indicated that it is a high priority to address the safety and congestion issues related to the segment of Interstate 5 between Columbia Boulevard north to State Route 500 in Vancouver, Washington.

The Federal Transit Administration (FTA) awards transit capital construction grants on a competitive basis. The CRC project will be submitting an application to the FTA for entry into Preliminary Engineering and eventually for a full funding grant agreement. The Metro region has been highly successful in securing FTA funds and it is considered reasonable, based on early cost-effectiveness rating analyses, that the high capacity transit component of the CRC Project will secure the $750 million in federal transit funding shown in the table below.

In addition, the Governors of Oregon and Washington have stated their commitment to work with their respective state legislatures to provide state funds to add to federal funding.

Also, tolling is another unique source of funding for the project. It would be a substantial transportation demand management tool as well as providing a significant revenue source. The DEIS states that tolls may supply 36 – 49% of the capital revenues for the highway elements of the project.

Finally, the state of Washington has accumulated credits from tolls imposed on other projects in the state that can be used as local match for federal funds. The state has indicated support for using a portion of these credits for the transit component of this project.

These funding sources for the total project may be summarized as follows (all figures in millions of dollars):

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Columbia River Crossing – Total Project Costs
(both Oregon and Washington sides)

Costs		Low	High
Highway		$2,773	$2,920
Transit		750	750
	Total	$3,523	$3,670

Revenues		Low	High
Toll Bond Proceeds		$1,070-$1,350	$1,070 - 1,350
Federal Discretionary Highway		400- 600	400 - 600
State Funds		823-1,303	970 - 1,450
New Starts		750	750
Toll Credits		188	188
	Total	$3,523	$3,670

Chapter 7, Implementation of the Metro 2035 Regional Transportation Plan, (Federal Component), Implementation (page 7-34) is amended as follows:

Interstate-5 North (I-84 to Clark County)

This heavily traveled route is the main connection between Portland and Vancouver. The Metro Council has approved a Locally Preferred Alternative for the Columbia River Crossing ~~project is evaluating the~~(CRC) project that creates a multi-modal ~~alternatives in~~solution for the Interstate 5 corridor between Oregon to Washington to address the movement of people and freight across the Columbia River. A~~number of planned and proposed alternative highway capacity improvements, high capacity,~~replacement bridge with three through lanes in each direction, reconstructed interchanges, tolls priced to manage travel demand as well as provide financing of the project construction, operation and maintenance, light rail transit to Vancouver, and bicycle and pedestrian investments have been identified for this corridor. As ~~improvements~~project details are evaluated and implemented in this corridor, the following ~~design considerations should be addressed:~~shall be brought back to JPACT and the Metro Council for a subsequent RTP amendment for this Project:

• ~~consider HOV lanes and peak period pricing~~

~~• high capacity transit alternatives from Vancouver to the Portland Central City (including light rail transit and express bus), recognizing that high capacity transit, light rail, has been built from the Portland Central City to Expo Center~~

~~• maintain an acceptable level of access to the central city from Portland neighborhoods and Clark County~~

~~• maintain off-peak freight mobility, especially to numerous marine, rail and truck terminals in the area~~ the number and design of auxiliary lanes on the I-5 Columbia River bridge and approaches to the bridge, including analysis of highway capacity and induced demand.

More generally in the I-5 corridor, the region should:

• consider the potential adverse human health impacts related to the project or existing human health impacts in the project area, including community enhancement projects to address environmental justice.

• consider ~~adding reversible express lanes to I-5~~managed lanes

• maintain an acceptable level of access to the central city from Portland neighborhoods and Clark County

• maintain off-peak freight mobility, especially to numerous marine, rail and truck terminals in the area

• consider new arterial connections for freight access between Highway 30, port terminals in Portland and port facilities in Vancouver, Wa.

• maintain an acceptable level of access to freight intermodal facilities and to the Northeast Portland Highway

• construct interchange improvements at Columbia Boulevard to provide freight access to Northeast Portland Highway

• address freight rail network needs

~~• consider additional Interstate Bridge capacity sufficient to handle project needs~~

• develop actions to reduce through-traffic on MLK and Interstate to allow main street redevelopment

• provide recommendations to the Bi-State Coordination Committee prior to JPACT and Metro Council consideration of projects that have bi-state significance.

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STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 08-3960, FOR THE PURPOSE OF ENDORSING THE LOCALLY PREFERRED ALTERNATIVE FOR THE COLUMBIA RIVER CROSSING PROJECT AND AMENDING THE METRO 2035 REGIONAL TRANSPORTATION PLAN WITH CONDITIONS

Date: June 26, 2008 Prepared by: Richard Brandman
Ross Roberts
Mark Turpel

BACKGROUND

Overview

The Columbia River Crossing (CRC) is a proposed multimodal bridge, transit, highway, bicycle and pedestrian improvement project sponsored by the Oregon and Washington transportation departments in coordination with Metro, TriMet and the City of Portland as well as the Regional Transportation Council of Southwest Washington, CTRAN and the City of Vancouver, Washington. (More detailed project information may be found at: http://www.columbiarivercrossing.org/)

The CRC project is designed to improve mobility and address safety problems along a five-mile corridor between State Route 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River.

The project would be funded by a combination of Federal Transit Administration (FTA) New Starts funding for the transit component, Federal Highway Administration (FHWA) funding for highway, freight, bicycle and pedestrian improvements, with local match being provided by the states of Oregon and Washington through toll credits and other funding. Tolls are also proposed for a new I-5 bridge to pay for a portion of the capital project and manage transportation demand.

Guiding the project is a 39 member CRC Task Force, of which Councilor Burkholder serves as the Metro representative. On June 5, 2008, the Metro Council approved policy guidance for Councilor Burkholder as its CRC Task Force member in the formulation of the draft locally preferred alternative (LPA) (after consideration of public testimony and review of options for a LPA). On June 24, the CRC Task Force approved recommendations for a LPA for the project sponsor agencies (including Metro) consideration.

Accordingly, the attached Resolution No. 08-3960 will provide for Metro Council consideration of:

1) Adoption of a CRC LPA.
2) Amendment of the federal component of the Metro 2035 Regional Transportation Plan (RTP).
3) Statement of additional Metro Council concerns and considerations regarding the Project.

Project History

The CRC Project history began in 1999, with the Bi-State Transportation Committee recommendation that the Portland/Vancouver region initiate a public process to develop a plan for the I-5 Corridor based on four principles:

- Doing nothing in the I-5 Corridor is unacceptable;
- There must be a multi-modal solution in the I-5 Corridor - there is no silver bullet;

- Transportation funds are limited. Paying for improvements in the I-5 Corridor will require new funds; and,
- The region must consider measures that promote transportation-efficient development.

Accordingly, the twenty-six member I-5 Transportation and Trade Partnership was constituted by Governors Locke and Kitzhaber, including a Metro Council representative.

In June 2002, the Partnership completed a *Strategic Plan* and on November 14, 2002, the Metro Council, through Resolution No. 02-3237A, For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations, endorsed the *Strategic Plan* recommendations including:

- Three through lanes in each direction on I-5, one of which was to be studied as an High Occupancy Vehicle (HOV) lane, as feasible;
- Phased light rail loop in Clark County in the vicinity of the I-5, SR500/4th Plan and I-205 corridors;
- An additional or replacement bridge for the I-5 crossing of the Columbia River, with up to two additional lanes for merging plus two light rail tracks;
- Interchange improvements and additional auxiliary and/or arterial lanes where needed between SR 500 in Vancouver and Columbia Boulevard in Portland, including a full interchange at Columbia Boulevard;
- Capacity improvements for freight rail;
- Bi-state coordination of land use and management of the transportation system to reduce demand on the freeway and protect corridor improvement;
- Involving communities along the corridor to ensure final project outcomes are equitable and committing to establish a fund for community enhancement;
- Developing additional transportation demand and system strategies to encourage more efficient use of the transportation system.

Several of the recommendations from the Strategic Plan have been completed. For example, construction of the I-5 Delta Park Project has begun.

The I-5 bridge element began in February 2005 with the formation of a 39 member Columbia River Crossing (CRC) Task Force. This Task Force, which includes a Metro Council representative, developed a vision statement, purpose and need statement and screening criteria.

The adopted project purpose is to: 1) improve travel safety and traffic operation on the I-5 crossing of the Columbia River; 2) improve the connectivity, reliability, travel times and operations of public transit in the corridor, 3) improve highway freight mobility and interstate commerce, and 4) improve the river crossing's structural integrity.

More specifically, the following issues concerning the existing conditions were cited as need:

- Safety - the bridge crossing area and approach sections have crash rates more than two times higher than statewide averages for comparable urban highways. Contributing factors are interchanges too closely spaced, weave and merge sections too short contributing to sideswiping accidents, vertical grade changes that restrict sight distance and very narrow shoulders that prevent avoidance maneuvers or safe temporary storage of disabled vehicles.
- Seismic - neither I-5 bridges meet seismic standards, leaving the I-5 corridor vulnerable in the event of a large earthquake;
- Bridge Alignment - the alignment of the I-5 bridges with the downstream railroad bridge contributes to hazardous barge movements;

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- Cost - rehabilitation of the existing bridges, bringing them to current standards would be more costly, both in money and some environmental impacts, such as water habitat conditions, than a replacement bridge;
- Traffic Impact - an arterial bridge would bring unacceptable traffic congestion to downtown Vancouver, Washington.

The CRC Project analyzed 37 distinct bridge, transit, highway and transportation demand management modes/designs, which the CRC Task Force narrowed to twelve. These twelve options then received even more analysis.

In November 2007, CRC staff, after further consideration of technical analyses and using the approved screening criteria and project purpose and need, recommended three alternatives be advanced to a draft environmental impact statement (DEIS). These included:

- Alternative 1) No Action;
- Alternative 2) A Replacement Bridge and Bus Rapid Transit with Complementary Express Bus Service; and
- Alternative 3) A Replacement Bridge and Light Rail Transit with Complementary Express Bus Service.

Open houses were held to take public comment about whether these three alternatives should be advanced to analysis in the DEIS. The Metro Council, other project sponsors and some members of the public expressed interest in a less expensive, smaller project alternative. Accordingly, two supplemental bridge alternatives (one with bus rapid transit, the other with light rail transit) were proposed to be added to the alternatives studied in the DEIS.

The Metro Council concurred with these five alternatives in adopting Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," on February 22, 2007.

On December 13, 2007, the Metro Council adopted the federal component of the 2035RTP. The RTP included funds for preliminary engineering and right-of-way purchase in the financially constrained system project list for a new bridge across the Columbia River. This item was reconfirmed with the adoption of the air quality conformity determination in February 2008 that assumed a new bridge with light rail transit to Vancouver.

In a meeting of the CRC Task Force in January 2008, an informal poll was taken that initiated discussion of the LPA. Strong support was found for:

- A replacement bridge with tolls;
- Light rail transit extended to Vancouver, Washington;
- Bicycle and pedestrian path improvements.

(Councilor Burkholder, the Metro Council representative, deferred comment in this survey citing the need to confer with the full Metro Council).

On May 2, 2008, a DEIS addressing the five CRC alternatives was released for a 60-day public comment period. During that time, the CRC project received 1,120 comments on the DEIS. The CRC also held two open houses attended by 425 people and held four question and answer sessions.

Later in May 2008, review and discussion of the CRC alternatives and the potential benefits and adverse impacts as disclosed in the CRC Draft Environmental Impact Statement were discussed by the Metro Council. After consideration of the CRC documents, Metro Council work session discussions and public testimony received at a Metro Council public hearing June 5, the Metro Council approved policy guidance by adopting Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," on June 5, 2008.

Resolution 08-3938B included the following major points:

- A multimodal approach that includes:
  - light rail transit extended to Vancouver;
  - A replacement bridge with three through lanes in each direction and the number of auxiliary lanes to be determined;
  - Tolls to manage travel demand as well as provide an ongoing funding source for bridge construction, operations and maintenance;
  - Improved bicycle and pedestrian facilities;
  - Compact land use development patterns with a mixture of housing types to minimize long commutes and reduce automobile dependence.
- Recognition that the above elements and others identified in an exhibit to the resolution will need to be satisfactorily addressed as part of the LPA or at later decision points, prior to a final decision.
- Need to address potential and existing health impacts and using a community enhancement fund to address environmental justice.
- Independent analysis of greenhouse gas emissions and whether the project alternatives would help achieve or frustrate greenhouse gas emission reduction goals for 2020 and 2050.
- Charging tolls as soon as legally and practicably possible and use of state-of-the-art demand management tool to influence travel behavior and reduce greenhouse gas emissions and reduce vehicle miles traveled.
- Recognition of the need for the Metro Council to consider an LPA adoption and an RTP amendment and that the two decisions could be made concurrently.

On June 24, 2008, the CRC Task Force, by a vote of 37-2, recommended the following:

- A replacement bridge with three through lanes northbound and southbound.
- Light rail as the preferred high capacity transit mode with an alignment and terminus based on FTA funding, technical considerations and Vancouver City Council and CTRAN votes in early July 2008.
- Formation of a formal oversight committee.
- Continuation of existing advisory committees dealing with freight, pedestrians and bicycles, urban design, community and environmental justice and creation of a new sustainability working group.
- A list of project and regional elements that have not been made final at this time, but which the CRC Project recognizes the need for consideration. (see Attachment 1 to this staff report)

In addition to the Metro Council public hearing on the project on June 5, 2008 and the CRC Task Force hearing on June 24, 2008, there were numerous public meetings, open houses, and mailings regarding the project. Additionally, the LPA and the need for an RTP amendment were discussed at the Transportation Policy Advisory Committee's (TPAC) May 30, 2008 meeting and both the RTP amendment and the LPA resolution were recommended at its June 27, 2008 meeting. The proposed RTP amendments and LPA were also discussed at the Joint Policy Advisory Committee on Transportation's (JPACT) June 12, 2008 meeting and approved at its __________ meeting.

This proposed Resolution No. 08-3960, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions, is generally consistent with the June 24 CRC Task Force recommendations. In addition, proposed Resolution No 08-3960 addresses the following:

1) A list of project concerns to be addressed and resolved (attached as Exhibit A to Resolution No. 08-03960).
2) Amendment of the 2035 RTP to:
    - revise the Financially Constrained Project List (appendix 1.1);
    - revise the "Other RTP Projects not included in the Financially Constrained list" (appendix 1.2);
    - amend Chapter 5, Financial Plan of the RTP, to include a section on the funding of the CRC project (and included as Exhibit B to Resolution No. 08-3960);
    - amend Chapter 7, Implementation of the RTP, to revise the description of the I-5 North corridor (and included as Exhibit C to Resolution No. 08-3960).

(A separate RTP amendment that would revise the state component of the RTP and include land use findings is not proposed at this time and would be addressed once more information and analysis is available concerning auxiliary lanes and other issues identified in Resolution No 08-3960.)

In addition to these immediate decisions, the following actions will take place in Fall 2008 and beyond include:

- Number of auxiliary travel lanes
- Bridge design details (such as bridge type, whether Stacked Highway/Transit design would work, be cost-effective and whether this aspect of the bridge should be pursued)
- Transportation Demand Management (TDM) specifics
- Interchange design specifics
- Bicycle and pedestrian design details
- More specificity on finance plan

The CRC Task Force's June 24 recommendations to consider a Locally Preferred Alternative (LPA) will also be brought to the cities of Portland and Vancouver, TriMet and CTRAN, and Metro and the Regional Transportation Council of Southwest Washington for adoption and corresponding transportation plan amendments. These actions will allow ODOT and WSDOT to submit to the FTA an application to enter preliminary engineering to prepare a final environmental impact statement (FEIS).

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[1] By July 8, the City of Vancouver and CTRAN are scheduled to conclude the alignment and terminus of the LRT line in Vancouver, Washington. In order to facilitate the bi-state transportation aspects of this draft resolution, these southwest Washington project partner decisions will be provided to the Joint Policy Advisory Committee (JPACT), which meets on July 10 to consider this resolution and to the Metro Council that meets on July 17 also to consider this resolution. Accordingly, draft Metro Resolution No. 08-3960 may be proposed for revision in July as a result.

ANALYSIS/INFORMATION

1. **Known Opposition** The CRC is a very large and complex transportation project. There are strong feelings – pro and con – associated with the project. Opposition to the project includes concerns raised regarding the need for the project, greenhouse gas emissions that could be generated by the project, costs, tolls and light rail extension to Vancouver, Washington.

2. **Legal Antecedents**

Federal

- National Environmental Policy Act
- Clean Air Act
- SAFETEA-LU
- FTA New Starts Process

State

- Statewide Planning Goals
- State Transportation Planning Rule
- Oregon Transportation Plan
- Oregon Highway Plan
- Oregon Public Transportation Plan
- Oregon Bicycle and Pedestrian Plan

Metro

- Resolution No. 02-3237A, "For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations," adopted on November 14, 2002.
- Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," adopted on February 22, 2007.
- Ordinance No. 07-3831B, "For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis," adopted on December 13, 2007.
- Resolution No. 08-3911, "For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program," adopted on February 28, 2008.
- Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," adopted on June 5, 2008.

3. **Anticipated Effects** The approval of this resolution would allow the submission of a New Starts application for light rail transit to Vancouver Washington as well as include proceeding with the next steps towards a replacement bridge with tolls and light rail transit. It would not resolve the number of auxiliary lanes or other issues and considerations listed in the resolution but which will need to be addressed in the future once additional information and analysis is completed.

4. **Budget Impacts** If there is a role for Metro to play in the completion of the CRC Final Environmental Impact Statement (this could be additional updated travel forecasting, for example), the CRC project would reimburse Metro for any costs incurred for such work.

RECOMMENDED ACTION

Adopt Resolution No. 08-3960, For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions.

Columbia River CROSSING

A RESOLUTION OF THE COLUMBIA RIVER CROSSING TASK FORCE TO PROVIDE DIRECTION TO THE COLUMBIA RIVER CROSSING PROJECT ON KEY DECISIONS FOR A LOCALLY PREFERED ALTERNATIVE

WHEREAS, the I-5 Interstate Bridge is one of only two Columbia River crossings between Vancouver, Washington and Portland, Oregon and approximately 150,000 people rely on crossing the I-5 Bridge daily by car, transit, bicycle and on foot; and

WHEREAS, the existing structures are aging and in need of seismic upgrade, and the closely-spaced interchanges are in need of safety improvements; and

WHEREAS, the movement of land and water-based freight is hindered by the current crossing, and

WHEREAS, high capacity transit does not currently connect Vancouver and Portland, and the bicycle and pedestrian paths do not meet current standards; and

WHEREAS, the I-5 Transportation and Trade Partnership Final Strategic Plan recommended congestion and mobility improvements within the I-5 Bridge Influence Area in 2002; and

WHEREAS, the Columbia River Crossing Task Force was established in February 2005, to advise the Oregon Department of Transportation and the Washington State Department of Transportation on project-related issues and concerns; and

WHEREAS, the Columbia River Crossing Task Force advised development of the project's Vision and Values Statement, alternatives development, and narrowing of the alternatives to five that would be studied in a Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project is committed to implementing the principles of sustainability into project planning, design and construction in order to improve the natural and social environment and the regional economy whenever possible; and to minimize effects related to climate change; and

WHEREAS, the Oregon State Department of Transportation, Washington State Department of Transportation, Metro Council, Southwest Washington Regional Transportation Council, TriMet, C-TRAN, City of Portland and City of Vancouver have worked collaboratively on the development of the Draft Environmental Impact Statement; and

WHEREAS, the Columbia River Crossing project published a Draft Environmental Impact Statement on May 2, 2008, disclosing the potential environmental and community impacts and potential mitigation of the five alternatives; and

WHEREAS, the Columbia River Crossing project is seeking public comments on the Draft Environmental Impact Statement from the Columbia River Crossing Task Force as well as the public through outreach events, working sessions and hearings with sponsor agencies, and through two open houses and two public hearings during the comment period; and

WHEREAS, the Columbia River Crossing Task Force has opted to confirm Key Decisions that will lead to selection of a Locally Preferred Alternative.

NOW, THEREFORE, BE IT RESOLVED THAT THE COLUMBIA RIVER CROSSING TASK FORCE MAKES THESE RECOMMENDATIONS TO THE COLUMBIA RIVER CROSSING PROJECT:

1. In regards to the river crossing selection, the CRC Task Force supports the construction of a replacement bridge with three through lanes northbound and southbound as the preferred option.
2. In regards to the high capacity transit selection, the CRC Task Force supports light rail as the preferred mode.
3. In regards to the alignment and terminus of the high capacity transit line, and based on the information provided to date, the CRC Task Force
    - Recognizes that the selection of the alignment and terminus options should be determined through a combination of:
        i. Federal New Starts funding eligibility,
        ii. Public and local stakeholder involvement,
        iii. CRC project evaluation and technical determination of the terminus that allows for the greatest flexibility for future high capacity transit extensions and connections in Clark County, and
        iv. Outcome of the Vancouver City Council and C-TRAN votes on July 7 and July 8, respectively.
4. Creation of a formal oversight committee that strives for consensus and provides for a public process of review, deliberation and decision-making for outstanding major project issues and decisions.
5. The Freight Working Group, the Pedestrian and Bicycle Advisory Committee, the Urban Design Advisory Group, the Community and Environmental Justice Group, and the newly formed Sustainability Working Group, shall continue their advisory roles for refinement of the LPA. These advisory groups shall report findings and recommendations to the local oversight committee.

6. The CRC Task Force understands that several project elements have not been finalized at the time of this resolution. These elements will need to be satisfactorily resolved through a process that includes public involvement, recommendations from governing bodies of the sponsor agencies, and recommendations by a local advisory committee. The CRC Task Force supports the consideration of the attached list of Supplemental Positions for Future Project and Regional Consideration.

Columbia River
CROSSING

Columbia River Crossing Project
Supplemental Positions for Future Project and Regional Consideration

For Project Consideration:
The Columbia River Crossing Task Force presents these supplemental positions for consideration during the post-Locally Preferred Alternative (LPA) phase of the project development process. The Columbia River Crossing Task Force supports the following in association with the CRC project:

- The continued development of a mitigation plan, including avoidance of adverse impacts
- The continued development of a sustainability plan, including the formation of a sustainability working group
- Further study and analysis to determine the appropriate number of auxiliary lanes, necessary for safety and functionality in the project area, and consistent with minimizing impacts. The project should recognize that auxiliary lanes are for interchange operations, not for enhanced mainline throughput, and design the bridge width accordingly.
- The continued commitment to provide enhancements within potentially impacted communities
- As articulated in the final strategic plan of the I-5 Trade and Transportation Partnership, establish a community enhancement fund for use in the impacted areas of the project; such a fund would be in addition to any impact mitigation costs identified through the Draft EIS and would be modeled on the successfully implemented community enhancement fund of the I-5 Delta Park Project and subsequent Oregon Solutions North Portland Diesel Emissions Reduction Project.
- Continued work to design interchanges in the project area that meet the safety and engineering standards and requirements of the Federal Highway Administration, the departments of transportation for Oregon and Washington and the cities of Portland and Vancouver, in a way that is consistent with minimizing impacts.
- Continued work to ensure that interchanges are freight sensitive and provide enhanced mobility, in a way that is consistent with minimizing impacts.
- Imposing tolls on the existing I-5 bridge as soon as legally and practically permissible to reduce congestion by managing travel demand as well as to provide an ongoing funding source for the project
- A public vote where applicable, regarding the funds required to implement the light rail line
- The development of an aesthetically pleasing, sustainable and cost-efficient river crossing that provides a gateway to Vancouver, Portland and the Northwest

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- Designing the project – river crossing, transit, and pedestrian and bicycle facilities – to be a model of sustainable design and construction that serves both the built and natural environment
- The development of light rail stations that meet the highest standards for operations and design. These stations would be designed to be safe and accessible to pedestrians, bicyclists, and people with disabilities.
- Continued development of a "world class" bicycle, pedestrian facility, as well as the consideration for provisions for low-powered vehicles such as scooters, mopeds and neighborhood electric vehicles, as part of the construction of a replacement river crossing
- Ensure that the preferred alternative solves the significant safety, congestion and mobility problems in the project area while meeting regional and statewide goals to reinforce density in the urban core and compact development that is both pedestrian friendly and enhances mobility throughout the project area and the region
- Development of an innovative transportation demand management (TDM) program to encourage more efficient use of limited transportation capacity
- Independent validation of the greenhouse gas and climate change analysis conducted in the Draft Environmental Impact Statement to determine the project's effects on air quality, carbon emissions and vehicle miles traveled per capita
- The inclusion of strategies aimed at reducing greenhouse gases and reducing vehicle miles traveled per capita. The Oregon Global Warming Commission or the Washington Climate Action Team should advise the CRC project on project related aspects that will help achieve both states greenhouse gas reduction goals set for 2020 and 2050.
- The development of a more detailed draft finance plan after the LPA is selected to define the funding and financing sources for this project from federal, state and local resources, while ensuring financial equity locally, within the region, and between the states of Oregon and Washington
- Independent review of the project's feasibility and risks, including the project's relationship to funding other transportation projects in the region
- Continued study of project health impacts such as those identified in the report submitted to the Task Force by the Multnomah County Health Department

For Regional Consideration:
There are system-wide transportation concerns that can only be resolved on a regional level and not by the Columbia River Crossing project. The Columbia River Crossing Task Force supports:

- Revisiting the remaining recommendations outlined in the *Strategic Final Plan* of the I-5 Transportation and Trade Partnership Study, dated September 2002
- Evaluating other bottlenecks within the system (e.g., I-405 / I-5 loop, Rose Quarter, etc.)
- Developing a regional plan for traffic demand management in the bi-state Portland-Vancouver region that promotes a reduction in vehicle miles traveled per capita

- Evaluating the effectiveness of a regional high occupancy vehicle (HOV) system
- Developing a regional plan for freight that considers the work of the I-5 Transportation and Trade Partnership and the CRC project's work with the CRC Freight Working Group
- Developing a web-based transit trip planning resource to plan transit trips in the Portland-Vancouver region

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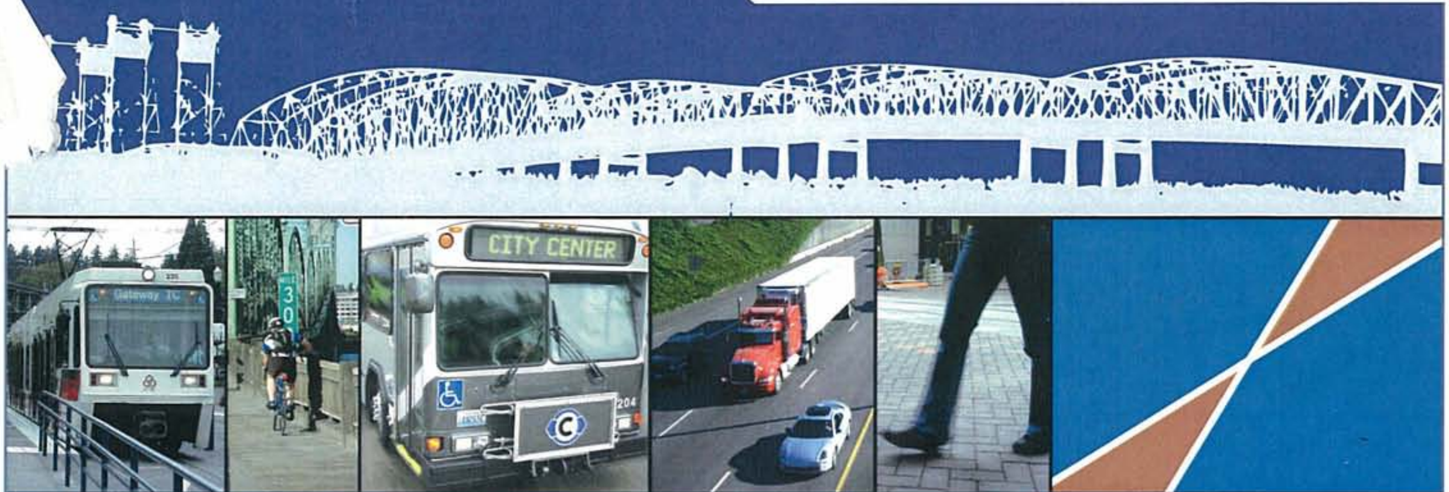

MAY 2008

Interstate 5
Columbia River Crossing Project

Draft Environmental Impact Statement and Draft Section 4(f) Evaluation

Volume 1 of 2

Columbia River CROSSING

United States Department of Transportation
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL TRANSIT ADMINISTRATION

Oregon Department of Transportation

Washington State Department of Transportation

C-TRAN TRIMET RTC METRO

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INTERSTATE-5 COLUMBIA RIVER CROSSING PROJECT

Vancouver, Washington and Portland, Oregon

Draft Environmental Impact Statement

Submitted Pursuant To:

The National Environmental Policy Act (42 U.S.C. 4322(2)(c))
and the Washington State Environmental Policy Act (Ch. 43.21 C RCW)

Submitted By:

Federal Highway Administration
Federal Transit Administration

and

Washington State Department of Transportation
Oregon State Department of Transportation
Southwest Washington Regional Transportation Council
Metro
Clark County Public Transportation Benefit Area
Tri-County Metropolitan Transportation District

In cooperation with

U.S. Army Corps of Engineers
U.S. Coast Guard
Federal Aviation Administration
National Park Service
Washington State Department of Archaeology and Historic Preservation
U.S. General Services Administration

John McAvoy
FHWA Major Projects Manager

4/21/2008
Date of Approval

R. F. Krochalis
FTA Regional Administrator, Region 10

21 April 2008
Date of Approval

WSDOT DEIS No: FHWA-WA-EIS-08-01-D

Megan White
Washington State Department of Transportation, Director, Environmental Services

4/21/08
Date of Approval

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Southwest Washington Regional Transportation Council, Executive Director

4/21/08
Date of Approval

Jeff Hamm
C-TRAN, Executive Director/CEO

4/21/08
Date of Approval

John Osborn
Oregon Department of Transportation, Columbia River Crossing Co-Director

4/21/08
Date of Approval

David Bragdon
Metro, Council President

21 April 2008
Date of Approval

Fred Hansen
TriMet General Manager

21 April, 2008
Date of Approval

Americans with Disabilities Act (ADA) Information

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

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.

Project Abstract

The Columbia River Crossing (CRC) project is a bridge, transit, and highway improvement project proposed by the Oregon and Washington Departments of Transportation, Southwest Washington Regional Transportation Commission (RTC), Metro, Clark County Public Transportation Benefit Area (C-TRAN), and Tri-County Metropolitan Transportation District (TriMet) to improve safety and mobility in the I-5 corridor between Portland, Oregon and Vancouver, Washington. I-5 is the main interstate corridor on the west coast from Canada to Mexico and one of only two roadway crossings of the Columbia River in the Portland-Vancouver metropolitan area. The CRC project focuses on a five mile segment of the I-5 corridor extending from State Route 500 in Vancouver to approximately Columbia Boulevard in Portland. Alternatives considered include a No-Build alternative and four multi-modal build alternatives that either replace or rehabilitate the existing river crossing, provide highway improvements, either extend light rail or provide bus rapid transit with several transit alignment and length options, improve bicycle and pedestrian facilities, consider tolling and implement transportation system management and demand measures.

The CRC project initiated this Environmental Impact Statement (EIS) to analyze the transportation performance and potential community and environmental impacts of the proposed alternatives. This analysis also considers the financial feasibility and cost-effectiveness of the alternatives. The findings of this study will be used to help identify a locally preferred alternative.

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Columbia River
CROSSING

DEIS Errata and Clarifications

Last updated: May 21, 2008

The following corrects errors in the I-5 Columbia River Crossing (CRC) Draft Environmental Impact Statement (DEIS) that was released for public review and comment on May 2, 2008. The Draft EIS will be further updated as errors are discovered or to clarify points of confusion. Such updates or corrections will be made either with additional errata or in the Final EIS anticipated to be released in summer 2009.

CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
Front Matter	v	"Lupke Center"	Luepke Center
Summary	10	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending on the transit terminus."	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 3,220 spaces, depending on the transit terminus."
Summary	14	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending on the transit terminus."	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 3,220 spaces, depending on the transit terminus."
Summary	15	Exhibit 14: Adjacent inset shows N Jantzen Beach Ctr extending over North Portland Harbor	This crossing over North Portland Harbor does not exist, nor is it a CRC project alternative
Summary	17	Exhibit 15: Adjacent inset shows N Jantzen Beach Ctr extending over North Portland Harbor	This crossing over North Portland Harbor does not exist, nor is it a CRC project alternative
Summary	20	Exhibit 17: Key for Detailed Area of River Crossing displays a "3" in the colored label boxes corresponding with northbound and southbound through and auxiliary lanes.	The "3" was chosen to make the key consistent and is not meant to imply that there would be three through and three auxiliary lanes in both directions. Please refer to the graphic to the left of key for the actual number of lanes over the river crossing. The type of lane (i.e., northbound or southbound, through or auxiliary) is denoted by the color of the label box.
Summary	21	Exhibit 18: Key for Detailed Area of River Crossing displays a "3" in the colored label boxes corresponding with northbound and southbound through and auxiliary lanes.	The "3" was chosen to make the key consistent and is not meant to imply that there would be three through and three auxiliary lanes in both directions. Please refer to the graphic to the left of key for the actual number of lanes over the river crossing. The type of lane (i.e., northbound or southbound, through or auxiliary) is denoted by the color of the label box.
Summary	23	Exhibit 21 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way **Washington**
Summary	23	Exhibit 21 shows the two-way Broadway alignment option in northern Vancouver on Main Street	This alignment option should be shown on Broadway

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CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
Summary	23	Exhibit 21 shows Park and Rides near the I-5 SR 14 interchange and near Mill Plain Blvd for the Lincoln Terminus option	These Park and Rides should be deleted for this terminus option, as they only apply to the Mill Plain MOS
Summary	24	Exhibit 22 incorrectly characterizes the park and rides paired with the Clark College MOS and Mill Plain MOS	Clark College MOS: Clark College ~~(surface lot)~~ <u>(structure)</u> Mill Plain MOS: SR-14 (surface <u>and structure) and Mill Plain (structure)</u>
Summary	24	Exhibit 22 lists the following total park and ride stalls included for each terminus option: 2,410 (Kiggins Bowl), 1,250 (Lincoln), 2,410 (Clark College), 2,365 (Mill Plain)	Each terminus option could be associated with a variety of park and ride options. However, the approximate number of spaces assumed in the DEIS analysis are: <u>2,500</u> (Kiggins Bowl), <u>2,410</u> (Lincoln), <u>1,250</u> (Clark College), <u>3,220</u> (Mill Plain).
Summary	25	Exhibit 23 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way <u>**Washington**</u>
Summary	30	Exhibit 26 incorrectly reports transit mode spilt	Error fixed in attached table, added explanatory footnotes and additional person throughput information for clarification
Summary	30	Exhibit 26: Capital Cost Estimate	The range of costs in exhibit 26 excludes costs to develop the DEIS and LPA. The preliminary cost estimate of $3.1-$4.2 billion includes work to date in addition to capital costs.
Summary	33	Exhibit 29 states "Transit mode split in p.m. peak period" as 17-21% (BRT) and 19-23% (LRT)	Should state: <u>15-18%</u> (BRT) and <u>17-20%</u> (LRT)
Summary	33	Exhibit 30 states "Transit mode split in p.m. peak period" as 22% (Kiggins Bowl terminus), 21% (Lincoln terminus), 19% (Clark College MOS), and 23% (Mill Plain MOS)	Should state: <u>19%</u> (Kiggins Bowl terminus), <u>19%</u> (Lincoln terminus), <u>17%</u> (Clark College MOS), and <u>20%</u> (Mill Plain MOS)
Summary	36	DraftEIScomments@columbiarivercrossing.com	DraftEIS<u>feedback</u>@columbiarivercrossing.com *[Note: emails sent to "DraftEIScomments@columbiarivercrossing.com will still be received and recorded. Also, most documents distributed in hardcopy were fixed with a sticker over the incorrect address.]*
Summary	Inside back cover	Phone number for CRC office is listed as: (360) 737-2725	Correct phone number is: (360) 737-272<u>6</u>
Chapter 1	3	"Ultimately, the preceding transportation planning studies of the CRC project area provided the underlying scope of this project, while coordination with stakeholder groups, the public, and a variety of local, state, and federal agencies provided important input on how this project should define why it is being imitated and what problems it seeks to address"	"Ultimately, the preceding transportation planning studies of the CRC project area provided the underlying scope of this project, while coordination with stakeholder groups, the public, and a variety of local, state, and federal agencies provided important input on how this project should define why it is being <u>initiated</u> and what problems it seeks to address"

CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
Chapter 2	8	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending on the transit terminus."	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to <u>3,220</u> spaces, depending on the transit terminus."
Chapter 2	12	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending on the transit terminus."	"The exclusive bus lanes would extend 2.07-4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to <u>3,220</u> spaces, depending on the transit terminus."
Chapter 2	19	A third bridge, parallel to these two bridges, would accommodate transit vehicles, bicyclists, and pedestrians. Two lanes or tracks would accommodate bus rapid transit or light rail, and a path at least 12 feet wide would be dedicated to bicyclists and pedestrians.	A third bridge, parallel to these two bridges, would accommodate transit vehicles, bicyclists, and pedestrians. Two lanes or tracks would accommodate bus rapid transit or light rail, and a path at least <u>16</u> feet wide would be dedicated to bicyclists and pedestrians.
Chapter 2	32	Exhibit 2.3-14 incorrectly characterizes the park and rides paired with the Clark College MOS and Mill Plain MOS	Clark College MOS: Clark College ~~(surface lot)~~ **<u>(structure)</u>** Mill Plain MOS: SR-14 (surface **<u>and structure) and Mill Plain (structure)</u>**
Chapter 2	33	Exhibit 2.3-15 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way **<u>Washington</u>**
Chapter 2	33	Exhibit 2.3-15 shows the two-way Broadway alignment option in north Vancouver on Main Street	This alignment option should be shown on Broadway
Chapter 2	33	Exhibit 2.3-15 shows Park and Rides near the I-5 SR 14 interchange and near Mill Plain Blvd for the Lincoln Terminus option	These Park and Rides should be deleted for this terminus option, as they only apply to the Mill Plain MOS
Chapter 2	34	Exhibit 2.3-16 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way **<u>Washington</u>**
Chapter 3	5	"In 2004, C-TRAN extended Route 4 to Hayden Island and the light rail station at Delta Park."	"In **<u>2007</u>**, C-TRAN extended Route 4 to Hayden Island and the light rail station at Delta Park."
Chapter 3	24	"With the No-Build Alternative, the transit mode split would be 1 percent of the afternoon/evening peak direction trips (up from 6 percent today) within the I-5 corridor."	"With the No-Build Alternative, the transit mode split would be <u>12</u> percent of the afternoon/evening peak direction trips (up from 6 percent today) within the I-5 corridor." [*Note: see clarification above about how mode split is reported in the DEIS*]
Chapter 3	Throughout section 3.1	Person throughput in cars and on transit (i.e., people over the I-5 Crossing during PM peak in transit) is reported incorrectly in the following places: • Exhibit 3.1-21, page 3-26 in chapter 3 • Page 3-29, second full paragraph	Correct person throughput numbers are included in corrected exhibits (those listed to the left) as an attachment to this document. New explanatory footnotes are also included in the tables.

CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
		• Exhibit 3.1-24, page 3-32 • Exhibit 3.1-25, page 3-34 • Page 3-37, second full paragraph • Exhibit 3.1-28, page 3-41	
Chapter 3	Throughout section 3.1	Transit mode split is reported incorrectly both in text and exhibits in the following places: • Exhibit 3.1-21, page 3-26 in chapter 3 • Exhibit 3.1-24, page 3-32 • Exhibit 3.1-25, page 3-34 • Exhibit 3.1-28, page 3-41 • Exhibit 3.1-33, page 3-53 • Exhibit 3.1-39, page 3-60 • Exhibit 3.1-46, page 3-72 • Exhibit 3.1-50, page 3-75	Correct mode spilt numbers are included in corrected exhibits as an attachment to this document. Additional mode spilt numbers and explanatory footnotes are also included in the tables.
Chapter 3	31	Second full paragraph – Nineteen percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit.	**Seventeen** percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit. **(Mode split is based on demand and does not include freight trips or trips that start or end outside of the Portland/Vancouver metropolitan area.)**
Chapter 3	33	Fourth full paragraph – Twenty-one percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit.	**Nineteen** percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit. **(Mode split is based on demand and does not include freight trips or trips that start or end outside of the Portland/Vancouver metropolitan area.)**
Chapter 3	39	Sixth full paragraph – Thirty-three percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit.	**Twenty-three** percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit. **(Mode split is based on demand and does not include freight trips or trips that start or end outside of the Portland/Vancouver metropolitan area.)**
Chapter 3	42	Third full paragraph – Thirty-seven percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit.	**Twenty-six** percent of travelers over the I-5 crossing during the afternoon/evening northbound peak would use transit. **(Mode split is based on demand and does not include freight trips or trips that start or end outside of the Portland/Vancouver metropolitan area.)**

CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
Chapter 3	44	"For the supplemental crossing, northbound travel times would improve for motorists using the through lanes (i.e., the western northbound bridge) by about 15 minutes, or 34 percent, compared to No-Build conditions. However, due to the seven hours of congestion expected to occur on the eastern northbound bridge, northbound vehicles using the eastern bridge (those entering the highway at Marine Drive or Hayden Island, and those exiting the highway at SR 14, City Center, Mill Plain...)"	"For the supplemental crossing, northbound travel times would improve for motorists using the through lanes (i.e., the western northbound bridge) by about 17 minutes, or 39 percent, compared to No-Build conditions. However, due to the seven hours of congestion expected to occur on the eastern northbound bridge, northbound vehicles using the eastern bridge (those entering the highway at Marine Drive or Hayden Island, and those exiting the highway at SR 14, City Center, Mill Plain...)"
Chapter 3	48	"Because of northbound traffic back-ups under the supplemental crossing, about 50 percent of the traffic demand to northbound I-5 from Hayden Island and Marine Drive and Hayden Island would go unserved, resulting in congested ramp terminals and local streets in the vicinity of these interchanges."	"Because of northbound traffic back-ups under the supplemental crossing, about 50 percent of the traffic demand to northbound I-5 from Hayden Island and Marine Drive ~~and Hayden Island~~ would go unserved, resulting in congested ramp terminals and local streets in the vicinity of these interchanges."
Chapter 3	58	Exhibit 3.1-38 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way **Washington**
Chapter 3	58	Exhibit 3.1-38 shows the two-way Broadway alignment option in north Vancouver on Main Street	This alignment option should be shown on Broadway
Chapter 3	58	Exhibit 3.1-38 shows Park and Rides near the I-5 SR 14 interchange and near Mill Plain Blvd for the Lincoln Terminus option	These Park and Rides should be deleted for this terminus option, as they only apply to the Mill Plain MOS
Chapter 3	59	"The Clark College Park and Ride surface lot would generate about 225 morning and 230 afternoon/evening peak hour vehicle trips."	"The Clark College Park and Ride surface lot would generate about 255 morning and 230 afternoon/evening peak hour vehicle trips."
Chapter 3	62	Exhibit 3.1-40 states "two-way Broadway" in the legend for a downtown Vancouver transit alignment option	Two-way **Washington**
Chapter 3	64	"The Clark College MOS terminus would have a peak period/peak direction transportation mode split comparable to the Kiggins Bowl terminus. Peak period/peak direction traffic over the Columbia River would be made up of 52 percent SOV, 29 percent HOV, and 19 percent transit. With the full length of the Kiggins Bowl terminus, the mode split would be 50 percent SOV, 29 percent HOV, and 21 percent transit."	"The Clark College MOS terminus would have a peak period/peak direction transportation mode split comparable to the Kiggins Bowl terminus. Peak period/peak direction traffic over the Columbia River would be made up of 52 percent SOV, 31 percent HOV, and 17 percent transit. With the full length of the Kiggins Bowl terminus, the mode split would be 51 percent SOV, 30 percent HOV, and 19 percent transit."
Chapter 3	66	"The Mill Plain MOS would likely have a peak period/peak direction mode split comparable to that for the Lincoln terminus. With the Mill Plain MOS the peak period/peak direction mode split would be 50 percent SOV, 27 percent HOV and 23 percent transit. With the Lincoln terminus, the mode split would be 50 percent SOV, 29 percent HOV, and 21 percent transit."	"The Mill Plain MOS would likely have a peak period/peak direction mode split comparable to that for the Lincoln terminus. With the Mill Plain MOS the peak period/peak direction mode split would be 51 percent SOV, 29 percent HOV and 20 percent transit. With the Lincoln terminus, the mode split would be 51 percent SOV, 30 percent HOV, and 19 percent transit."

CHAPTER	PAGE	CURRENT TEXT	CORRECTED TEXT/CLARIFICATION
Chapter 3	66	With the Mill Plain MOS, there would be 1,100 spaces at two joint-use parking structures in downtown Vancouver, plus two additional satellite lots, for a total of 2,758 spaces.	With the Mill Plain MOS, there would be 1,100 spaces at two joint-use parking structures in downtown Vancouver, plus two additional satellite lots, for a total of 3,220 spaces.
Chapter 3	74	BRIDGE TOLL: TRANSIT RIDERSHIP AND MODE SPLIT	BRIDGE TOLL: TRANSIT RIDERSHIP ~~AND MODE SPLIT~~
Chapter 3	74	Increased transit ridership caused by tolling would produce a greater increase in transit mode split. In general, tolling would increase transit ridership over the river, decrease auto usage over the river, and thus increase transit mode split.	~~Increased transit ridership caused by tolling would produce a greater increase in transit mode split. In general, tolling would increase transit ridership over the river, decrease auto usage over the river, and thus increase transit mode split.~~ Transit ridership would increase due to tolling. This increase combined with the decreased auto usage of the crossing, would likely result in a higher transit mode split.
Chapter 3	99	Exhibit 3.3-3 contains duplicate footnotes (footnotes "b" and "d" are the same)	Footnote "d" should be deleted.
Chapter 3	114	Exhibit 3.3-16 incorrectly displays the "16th St" label	~~16th St~~ McLoughlin Blvd
Appendix D	1	Table footnote: "The Clark College MOS option would require the acquisitions shaded in gray in the tables for the "Northern Vancouver Connection;" The Mill Plain MOS would avoid most of these impacts in northern Vancouver except for"	Table footnote: The Clark College MOS option would require the acquisitions shaded in gray in the tables for the "Northern Vancouver Connection;" The Mill Plain MOS would avoid most of these impacts in northern Vancouver except for those associated with the Lincoln and Kiggins Bowl Park and Rides."

Exhibit 26
Summary of Transportation Effects and Cost for Each Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Hours of congestion/day	15 hours	3.5-5.5 hours	3.5-5.5 hours	10.75 hours	10.75 hours
<u>Persons served over the I-5 Crossing during PM peak</u>[a]	28,550 total	40,500 total	41,650 total	31,600 total	33,050 total
<u>Via autos</u>	26,500	34,400	34,400	25,700	25,700
<u>Via transit (total)</u>	2,050	6,100	7,250	5,900	7,350
<u>*Via high-capacity transit*</u>	<u>*0*</u>	<u>*2,450*</u>	<u>*4,600*</u>	<u>*2,750*</u>	<u>*4,900*</u>
<u>*Via bus on I-5*</u>	<u>*2,050*</u>	<u>*3,650*</u>	<u>*2,650*</u>	<u>*3,150*</u>	<u>*2,450*</u>
<u>Transit mode split in PM peak for all I-5 crossing trips</u>[b]	<u>7%</u>	<u>15%</u>	<u>17%</u>	<u>19%</u>	<u>22%</u>
<u>Transit travel time from Mill Plain station to Expo Center via HCT</u>	<u>N/A</u>	<u>8 min</u>	<u>7 min</u>	<u>14 min</u>	<u>8 min</u>
Vehicle trips over the I-5 crossing/day	184,000	178,000[c]	178,000[c]	165,000[c]	165,000[c]
Pedestrian and bicycle connections	Potentially no improvement to connections.	Provide continuous grade-separate multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separate multi-use path between Marine Drive and downtown Vancouver.	Improvements over the river but has at-grade crossings on Hayden Island.	Improvements over the river but has at-grade crossings on Hayden Island.
Traffic safety	Potentially no improvement.	Reduced congestion and improved highway design would reduce collisions.	Reduced congestion and improved highway design would reduce collisions.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.
Transit safety	Potentially no changes	Additional buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	High frequency of buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.
Effect on river navigation	Potentially no improvement	Eliminates S-curve maneuver and reduces number of piers.	Eliminates S-curve maneuver and reduces number of piers.	S-curve maneuver worsened with more piers and narrower channel.	S-curve maneuver worsened with more piers and narrower channel.
Capital cost[d]	$0	$3,260 - $3,915	$3,368 - $4,091	$3,125 - $3,781	$3,214 - $3,950

Sources: CRC Traffic Technical Report, 2008; CRC Transit Technical Report, 2008; CRC Cost Risk Assessment, 2007.

a Total number of people in cars and on transit vehicles using the I-5 crossing traveling north during the four-hour afternoon/evening peak period (3 p.m. to 7 p.m.).

b Transit mode split is based on service volumes. For demand based mode split, see Exhibits 29 and 30.

c This information is based on a representative combination of park and ride locations and sizes. The relationships between the alternatives' ridership and mode split would change based on changes to park and ride locations and lot sizes. These values assume a Lincoln terminus. See Exhibit 3.1-39 for information on how transit ridership and transit mode split would vary with each of the transit terminus options.

d Capital costs are in millions of year-of-expenditure dollars. Cost ranges are due to the HCT terminus option in each of the build alternatives and to confidence (low being 60% confidence that cost would not be exceeded, and high being 90% confidence that cost would not be exceeded.)

Exhibit 3.1-21

Alternative 2: Replacement Crossing with Bus Rapid Transit

Alternative 2: Replacement Crossing with Bus Rapid Transit				
Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Persons served over the I-5 Crossing during PM peak[a]				
Via autos	34,400 (NB)			
Via transit[b]	6,100 (NB)			
Transit mode split in p.m. peak period for all I-5 crossing trips	15%			
Transit travel time from Mill Plain station to Expo Center	8 min	8 min	8 min	8 min
Vehicles over the I-5 crossing each weekday	178,000	178,000	179,500	179,500
Hours of congestion per day	3.5-5.5 hours	3.5-5.5 hours	3.5-5.5 hours	3.5-5.5 hours
Pedestrian and bicycle connections	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.
Annual transit operations and maintenance costs ($ million)[c]	$74.9	$75.1	$74.9	$74.9
Traffic safety and security	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.
Transit safety and security	Additional buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	Additional buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	Additional buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	Additional buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.

[a] Total number of people crossing the river on I-5 traveling north (NB) during the afternoon/evening peak period. This includes all freight trips and all other trips regardless of where they begin or end. Transit mode split is based on service volumes. For mode split based on demand volumes, see exhibits 3.1- 33, 34, and 39.

[b] This information is based on a representative combination of park and ride locations and sizes. The relationships between the alternatives' ridership and mode split would change based on changes to park and ride locations and lot sizes. These values assume a Lincoln terminus. See Exhibit 3.1-39 for information on how transit ridership and transit mode split would vary with each of the transit terminus options.

[c] Total annual cost to run C-TRAN local and express routes, TriMet N Portland local buses, MAX LRT Yellow Line, and HCT service.

[d] Taking into account exclusive guideway length, park-and-ride structure, operating characteristics, etc., these figures were extrapolated from data produced from modeling Alternative 3 using ratio differences between alignments.

Note: The Stacked Transit/Highway Bridge design would perform the same as the three-bridge replacement design.

Exhibit 3.1-24
Alternative 3: Replacement Crossing with Light Rail

	Alternative 3: Replacement Crossing with Light Rail			
Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Persons served over the I-5 Crossing during PM peak[a]				
Via autos	34,400 (NB)			
Via transit[b]	7,250 (NB)			
Transit mode split in p.m. peak period for all I-5 crossing trips	17%			
Transit travel time from Mill Plain station to Expo Center	7 min	7 min	7 min	7 min
Vehicles over the I-5 crossing each weekday	178,000	178,000	179,500	179,500
Hours of congestion per day	3.5-5.5 hours	3.5-5.5 hours	3.5-5.5 hours	3.5-5.5 hours
Pedestrian and bicycle connections	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.	Provide continuous grade-separated multi-use path between Marine Drive and downtown Vancouver.
Annual transit operations and maintenance costs ($ million)[c]	$74.0	$73.3	$72.7	$72.6
Traffic safety and security	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.	Reduced congestion and improved safety design would reduce collisions.
Transit safety and security	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.

[a] Total number of people crossing the river on I-5 traveling north (NB) during the afternoon/evening peak period. This includes all freight trips and all other trips regardless of where they begin or end. Transit mode split is based on service volumes. For mode split based on demand volumes, see exhibits 3.1- 33, 34, and 39.

[b] This information is based on a representative combination of park and ride locations and sizes. The relationships between the alternatives' ridership and mode split would change based on changes to park and ride locations and lot sizes. These values assume a Lincoln terminus. See transit terminus section below for information on how the transit terminus options affect vehicle trips. See Exhibit 3.1-39 for information on how transit ridership and transit mode split would vary with each of the transit terminus options.

[c] Total annual cost to run C-TRAN local and express routes, TriMet N Portland local buses, MAX LRT Yellow Line, and HCT service.

[d] Taking into account exclusive guideway length, park-and-ride structure, operating characteristics, etc., these figures were extrapolated from data produced from modeling Alternative 3 using ratio differences between alignments.

Note: The Stacked Transit/Highway Bridge design would perform the same as the three-bridge replacement design.

Exhibit 3.1-25

Alternative 4: Supplemental Crossing with Bus Rapid Transit

	Alternative 4: Supplemental Crossing with Bus Rapid Transit			
Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Persons served over the I-5 Crossing during PM peak[a]				
Via autos	25,700 (NB)			
Via transit[b]	5,900 (NB)			
Transit mode split in p.m. peak period for all I-5 crossing trips	19%			
Transit travel time from Mill Plain station to Expo Center	14 min	14 min	14 min	14 min
Vehicles over the I-5 crossing each weekday	165,000	165,000	166,500	166,500
Hours of congestion per day	10.75 hours	10.75 hours	10.75 hours	10.75 hours
Pedestrian and bicycle connections	Improvements over the river but has at-grade crossings on Hayden Island.	Improvements over the river but has at-grade crossings on Hayden Island.	Improvements over the river but has at-grade crossings on Hayden Island.	Improvements over the river but has at-grade crossings on Hayden Island.
Annual transit operations and maintenance costs ($ million)[c]	$114.1	$114.4	$114.2	$114.1
Traffic safety and security	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.
Transit safety and security	High frequency of buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	High frequency of buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	High frequency of buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.	High frequency of buses could increase collisions but dedicated guideway may improve separation of modes. Potential security issues would need to be addressed at less visible stations.

[a] Total number of people crossing the river on I-5 traveling north (NB) during the afternoon/evening peak period. This includes all freight trips and all other trips regardless of where they begin or end. Transit mode split is based on service volumes. For mode split based on demand volumes, see exhibits 3.1- 33, 34, and 39.

[b] This information is based on a representative combination of park and ride locations and sizes. The relationships between the alternatives' ridership and mode split would change based on changes to park and ride locations and lot sizes. These values assume a Lincoln terminus. See transit terminus section below for information on how the transit terminus options affect vehicle trips. See Exhibit 3.1-39 for information on how transit ridership and transit mode split would vary with each of the transit terminus options.

[c] Total annual cost to run C-TRAN local and express routes, TriMet N Portland local buses, MAX LRT Yellow Line, and HCT service.

[d] Taking into account exclusive guideway length, park-and-ride structure, operating characteristics, etc., these figures were extrapolated from data produced from modeling Alternative 3 using ratio differences between alignments.

Exhibit 3.1-28

Alternative 5: Supplemental Crossing with Light Rail

	Alternative 5: Supplemental Crossing with Light Rail			
Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Persons served over the I-5 Crossing during PM peak[a]				
Via autos	25,700 (NB)			
Via transit[b]	7,350 (NB)			
Transit mode split in p.m. peak period for all I-5 crossing trips	22%			
Transit travel time from Mill Plain station to Expo Center	8 min	8 min	8 min	8 min
Vehicles over the I-5 crossing each weekday	165,000	165,000	166,500	166,500
Hours of congestion per day	10.75 hours	10.75 hours	10.75 hours	10.75 hours
Pedestrian and bicycle connections	Improvements but has at-grade crossings on Hayden Island.	Improvements but has at-grade crossings on Hayden Island.	Improvements but has at-grade crossings on Hayden Island.	Improvements but has at-grade crossings on Hayden Island.
Annual transit operations and maintenance costs ($ million)[c]	$106.5	$105.5	$104.7	$104.5
Traffic safety and security	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.	Improvement to highway design for safety, but some compromises on the existing I-5 bridges.
Transit safety and security	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.	New mode (light rail) could increase collisions but dedicated guideway would improve separation of modes. Potential security issues would need to be addressed at less visible stations.

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[a] Total number of people crossing the river on I-5 traveling north (NB) during the afternoon/evening peak period. This includes all freight trips and all other trips regardless of where they begin or end. Transit mode split is based on service volumes. For mode split based on demand volumes, see exhibits 3.1- 33, 34, and 39.

[b] This information is based on a representative combination of park and ride locations and sizes. The relationships between the alternatives' ridership and mode split would change based on changes to park and ride locations and lot sizes. These values assume a Lincoln terminus. See transit terminus section below for information on how the transit terminus options affect vehicle trips. See Exhibit 3.1-39 for information on how transit ridership and transit mode split would vary with each of the transit terminus options.

[c] Total annual cost to run C-TRAN local and express routes, TriMet N Portland local buses, MAX LRT Yellow Line, and HCT service.

[d] Taking into account exclusive guideway length, park-and-ride structure, operating characteristics, etc., these figures were extrapolated from data produced from modeling Alternative 3 using ratio differences between alignments.

Exhibit 3.1-33
Comparison of Transit Mode Split over the I-5 Columbia River Crossing

	No-Build	BRT	LRT
P.M. peak direction SOV[a]	54%	53%	50%
P.M. peak direction HOV[a]	33%	31%	30%
P.M. peak direction transit	13%	17%	19%

Source: 2007 travel demand forecasting outputs.

[a] SOV – Single-Occupancy Vehicle, HOV – High-Occupancy vehicle.

Exhibit 3.1-39
Transit Terminus Characteristics and Performance

Characteristic		Kiggins Bowl terminus	Lincoln terminus	Clark College MOS	Mill Plain MOS
Daily Passenger Trips on Transit over alignment		21,100	20,800	18,200	19,100
Annual Passenger Trips on Transit over alignment		6,780,000	6,670,000	5,820,000	6,110,000
PM Peak Direction Mode Split over I-5 river crossing	SOV	51 percent	51 percent	52 percent	51 percent
	HOV	30 percent	30 percent	31 percent	29 percent
	Transit	19 percent	19 percent	17 percent	20 percent
Transit Accessibility	Clark County households within ½ mile of HCT station	5 percent	5 percent	4 percent	3 percent
	Clark County employment within ½ mile of HCT station	11 percent	11 percent	10 percent	9 percent
Estimated Capital Cost		**$1,068.8M**	**$879.3M**	**$674.9M**	**$615.8M**
Annual Operating Cost (Increment over the No-Build)		**$4,240,000**	**$3,510,000**	**$2,950,000**	**$2,830,000**
Annualized Cost per Transit Guideway River Crossing		**$13.67**	**$11.55**	**$10.38**	**$8.91**

Source: 2007 travel demand forecasting outputs.

Note: Data presented in this table is for light rail. The relationship between alignments and MOS options would be the same for BRT.

Exhibit 3.1-46
Ridership and Mode Split for Efficient and Increased Transit Operations

	Efficient Operations		Increased Operations	
	BRT	**LRT**	**BRT**	**LRT**
Transit riders over the I-5 crossing[a]				
PM peak period	4,900	6,100	5,600	6,700
Daily	16,800	20,800	19,800	23,100
Transit mode split over the I-5 crossing[b]				
PM peak period	17%	19%	23%	26%
Daily	13%	15%	15%	16%

[a] Riders over the I-5 crossing are based on cutline data.

[b] Transit mode split data is based on Selectlink analysis based on district to district transit travel.

Source: 2007 Travel Demand Forecasting Outputs.

Exhibit 3.1-50
Transit Trips across the I-5 River Crossing[a]

	No Toll	I-5 Standard Toll	I-5 Higher Toll	I-5 and I-205 Standard Toll
Daily transit trips across the I-5 river crossing	19,300	20,800	21,400	21,700

Source: 2007 Travel Demand Forecasting Outputs.

[a] These data are for light rail, but the relationship would be the same for BRT.

FACT SHEET

Project Title

Interstate-5 Columbia River Crossing

Project Description

The Interstate-5 (I-5) Columbia River Crossing is a bridge, transit and highway improvement project of the Oregon and Washington transportation departments, the Southwest Washington Regional Transportation Council, Metro, C-TRAN, and TriMet. The project's purpose is to reduce congestion, enhance safety, and increase mobility. The project area begins at State Route 500 in Vancouver, Washington, and extends to Columbia Boulevard in Portland, Oregon, and includes the Interstate Bridge across the Columbia River.

Date of Issue

May 2, 2008

Document Availability

Download an electronic copy: **www.columbiarivercrossing.com**

Request a CD-ROM or printed copy of the DEIS:

Submit request to **feedback@columbiarivercrossing.org**, or

Call (360) 737-2725 or (503) 256-2726 or toll free at (866)396-2726

The Executive Summary and CD of the Draft EIS are available at no charge. Hard copies of the Draft EIS are available for purchase.

The Draft EIS is also available for review at various public libraries and meeting places throughout the project area.

Washington Locations:

Esther Short Building 610 Esther Street, Vancouver, WA 98660	(360) 696-8200
Marshall Center 1009 E McLoughlin Blvd, Vancouver, WA 98663	(360) 487-7100
Lupke Center 1009 E McLoughlin Blvd, Vancouver, WA 98663	(360) 696-8202
Firstenburg Center 700 NE 136th Avenue, Vancouver, WA 98684	(360) 487-7001
Fort Vancouver Regional Library 1007 E Mill Plain Blvd, Vancouver, WA 98663	(360) 695-1561
Washington State University - Vancouver Campus - Library 14204 NE Salmon Creek Ave, Vancouver, WA 98686	(360) 546-9680
Clark College - Cannell Library 1933 Fort Vancouver Way #112, Vancouver, WA 98663	(360) 992-2869

Oregon Locations:

Peninsula Park Community Center 700 N Rosa Parks Way, Portland, OR 97217	(503) 823-3620
St. Johns Community Center 8427 N Central Street, Portland, OR 97203	(503) 823-3192
Matt Dishman Community Center 77 NE Knot Street, Portland, OR 97212	(503) 823-3673
University Park Community Center 9009 N Foss Avenue, Portland, OR 97203	(503) 823-3631
Multnomah County Central Library 801 SW 10th Ave, Portland, OR 97205	(503) 988-5123
Portland State University – Branford P. Millar Library 1875 SW Park, Portland, OR 97201	(503) 725-5874
Portland Community College - Cascade Campus - Library 705 N Killingsworth Street, Portland, OR 97217	(503) 244-6111
University of Portland Library – Wilson W. Clark Memorial Library 5000 N. Willamette Blvd, Portland, OR 97203	(503) 943-7788
Albina Library 3605 NE 15th Avenue, Portland, OR 97212	(503) 988-5362
North Portland Library 512 N Killingsworth Street, Portland, OR 97217	(503) 988-5394
St. Johns Library 7510 N Charleston Avenue, Portland, OR 97203	(503) 988-5397

Additionally, copies have been provided to all active neighborhood associations in the project area. Please contact your neighborhood leader to request to borrow the document.

Comment Period

May 2, 2008 to July 1, 2008

Review Comments and Contact Information

Where to send written comments:

Columbia River Crossing
c/o Heather Gundersen
700 Washington Street, Suite 300
Vancouver, WA 98660

Where to email comments: **DraftEISfeedback@columbiarivercrossing.org**

For more information regarding this document please contact:

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700 Washington Street, Suite 300
Vancouver, WA 98660
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Comments on the Draft EIS will be responded to in the Final Environmental Impact Statement, expected to be published in Summer 2009.