Hicks RV Park

Chehalis, WA

Drainage and Erosion Control Report

Fuller Designs Project No. 2140

March 8th, 2022

Prepared by:

FULLER DESIGNS

1101 Kresky Ave., Centralia, WA 98531; 360-807-4420

PRELIMINARY DRAINAGE AND EROSION CONTROL REPORT

Hicks RV Park

0 Exhibitor Rd.
Chehalis, WA

Project Information

Contact: Kevin & Melody Hicks
PO Box 500
Rainier, WA 98576

Reviewing Agency

Jurisdiction: City of Chehalis
Contact: Celeste Wilder, Engineering Technician

References

2019 Stormwater Management Manual for Western Washington (SWMMWW)
City of Winlock Design Guidelines (updated 2020)

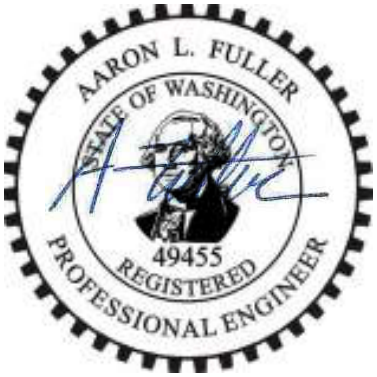
Project Engineer

Prepared by: Fuller Designs, Inc.
1101 Kresky Ave.
Centralia, WA 98531
(360) 807-4420

Contact: Aaron Fuller, PE

"I hereby certify that this Drainage and Erosion Control Report for the Hicks RV Park project has been prepared by me or under my supervision and meets minimum standards of the City of Chehalis and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."

03/14/2022



Exp.12/21/2022

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DRAINAGE AND EROSION CONTROL REPORT

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SECTION 1 – PROPOSED PROJECT DESCRIPTION

Site Address: 0 Exhibitor Rd., Chehalis, WA

Parcel Number(s): 005605080007

Total Site Area: 4.11 Acres

Zoning: CG – General Commercial

Sec, Twn, Rge: Section 17, Township 14N, Range 02W

Proposed Improvements
The site is located on Exhibitor Road approximately 420 feet west from its intersection with NE Kresky Ave. This project will construct 46 RV Parking stalls with adjacent standard parking and the needed access roads.

Stormwater runoff from the proposed impervious areas will be collected via filter catch basins, and then conveyed to a pipe infiltration system.

The lot will be served by:

City of Chehalis	Water
Lewis County Sewer District #4	Sewer
Lewis County PUD	Electricity
Centurylink & Comast	Telecommunications
Lemay	Refuse & Recycling

The subject property is completely bordered by commercial zoning in the City of Chehalis.

SECTION 2 – EXISTING CONDITONS DESCRIPTION

The lot currently fronts Exhibitor Road, it is composed of an unoccupied parcel, 95% of which is natural ground cover, and the remaining 5% of land is a strip of asphalt pavement which is currently used as access/parking for the Southwest Washington Fairgrounds across the street. Grasses and small shrubs are predominant throughout the site. Most of the project area is fairly flat and drains towards the south-east property line and into the Salzer Creek. A geotechnical report, a cultural resource assessment and a critical areas report were performed and are part of Section 7.

According to the online USDA Web Soil Survey tool, soils in the area are reed silty clay loam (172). In the Geotechnical report it is recommended that for in-ground infiltration galleries, a maximum design infiltration rate of 13.9 in/hr to be used.

SECTION 3 – OFFSITE ANALYSIS REPORTS

The area immediately adjacent to the proposed project properties is:

- West – GC – City General Commercial
- South – GC – City General Commercial
- East – GC – City General Commercial
- North – GC – City General Commercial

The overall site watershed flows into the Salzer Creek, southwest of the project site. Properties on the west side are slightly higher but have an existing storm drainage system which captures their water runoff, reason why those properties don't contribute to this site runoff.

The proposed project plans to maintain the natural drainage paths.

SECTION 4 – APPLICABLE MINIMUM REQUIREMENTS

The minimum requirements for stormwater development and redevelopment sites are listed in Volume I chapter 3 of the 2019 Washington State Department of Ecology Stormwater Management Manual for Western Washington (SWMMWW). Not all minimum requirements of this section apply to all projects. Determination of applicable minimum requirements is based on section I-3.3 of the WSDOE SWMMWW.

Based on the thresholds given in figures I-3.1 and I-3.2 of the SWMMWW, the proposed Hicks RV Park project will create more than 5000 square feet of new impervious surface and thus must address all minimum requirements. These requirements as they apply to the project are discussed in more detail below.

Minimum Requirement #1 – Preparation of Stormwater Site Plans:

A Stormwater Site Plan has been prepared (see Erosion Control and Drainage Plans).

Minimum Requirement #2 – Construction Stormwater Pollution Prevention Plan

A Construction Stormwater Pollution Prevention Plan (SWPPP) has been prepared. See section 7.

Minimum Requirement #3 – Source Control of Pollution

All known, available, and reasonable source control BMPs shall be applied to the project to limit pollutants from encountering stormwater. Construction specific BMP's will be provided during construction (see Section 7 SWPPP for reference).

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls

Stormwater leaving the site will be either dispersed toward natural drainages or directed toward the proposed pipe infiltration system. The same discharge points will be used in both pre and post development. Improvements onsite do not

impact natural drainages. A small buffer impact of 1,375' of buffer was encroached on. As mitigation buffer averaging is proposed with added buffer of 1,407sf. Please refer to the critical area report prepared for this project, section 7, for further buffer modification descriptions.

Minimum Requirement #5 – On-site Stormwater Management

This Project is outside the UGA but smaller than five acres. Based on the thresholds given in Figure I-3.3 from the SWMMWW (Figure 4.2, right), BMPs from lists #1, #2 and #3 of Table I-3.2 in Volume I of the SWMMWW are not applicable as the LID performance standards have been met and BMP T5.13, Post Construction Soil Quality and Depth, shall be implemented on the site.

The proposed BMPs are as follows:

Lawn and Landscape Areas:

- All disturbed areas not covered with a hard surface, and all new lawn and landscape areas will contain soils meeting the Post-Construction Soil Quality and Depth (BMP T5.13) requirements.

Roof Areas:

- Roof surfaces will meet BMP T5.10A, Downspout Full Infiltration system.

Minimum Requirement #6 – Runoff Treatment

This project proposes to create more than 5000 square feet of pollution-generating hard surface (PGHS) and is subject to this minimum requirement.

In the present, existing predeveloped runoff flows downhill towards the southeastern side of the site, and down into the existing Salzer Creek. In the proposed, developed condition Road and other pavement surfaces will be routed through a Contech StormFilter system to remove suspended solids and then routed into an underground detention pipe system. Treatment flow rates were established by using the WWHM12 continuous inflow modeling software. The required treatment flowrate is 59.34 gpm. The storm filter system was sized to handle the full treatment flowrate and bypass the higher storm events. Each storm filter can treat 18.79 gpm of runoff. A system using 4 storm filters was chosen. Flows higher than 59.34 gpm will be bypassed directly into the detention facility.

Minimum Requirement #7 – Flow Control

The development pre and post runoff rates were compared based on existing and proposed land coverage types using the WWHM2012 continuous inflow model.

After collection and treatment, 100-percent of the stormwater runoff will be infiltrated through a pipe system composed of (3) 197 l.f. of 30" perforated pipes in a 9.5 ft x 3.5 ft trench. WWHM2012 (WWHM2012 Report, Section 5) was utilized to determine the facility size necessary for developed condition of basin1.

Runoff from roof area was not accounted given that said runoff will be ground infiltrated by underground perforated pipe and will not be routed to the main storm pipe system.

Minimum Requirement #8 – Wetlands Protection

The thresholds identified in Minimum Requirement #6 – Runoff Treatment, and Minimum Requirement #7 – Flow Control are used to determine the applicability of this requirement to discharges to wetlands. Since Minimum Requirements #6 and #7 are properly mitigated, Minimum Requirement #8 is considered satisfied.

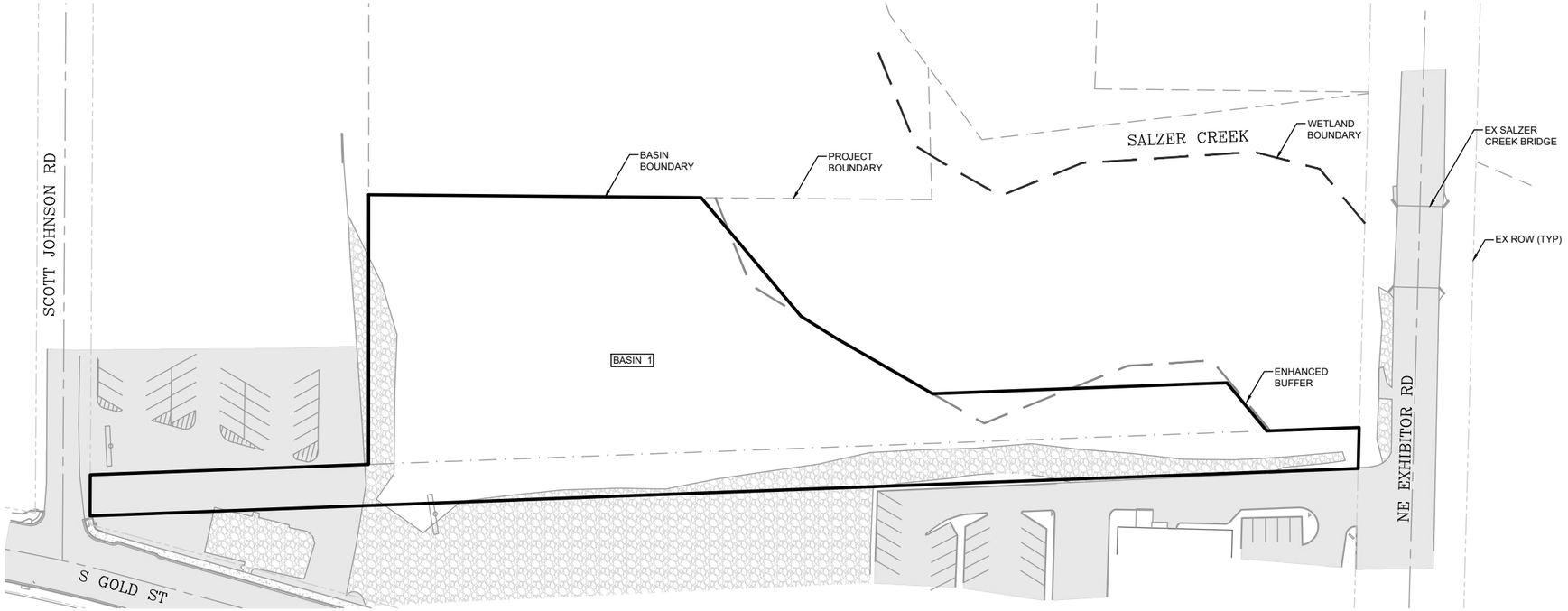
Minimum Requirement #9 – Operation and Maintenance

Maintenance of storm drainage facilities (catch basins, infiltration system) will be the responsibility of the landowner whose property the individual structure is located on. All improvements within Exhibitor Rd. (roadside ditches, culverts, etc..) will be maintained by City of Chehalis. A storm drainage operation and maintenance plan are included in this report. If required by the City of Chehalis, a performance bond or security can be obtained prior to final approval.

SECTION 5 – PERMANENT STORMWATER CONTROL PLAN

A pre/post basin flow control analysis, basin map, sub basin water quality analysis calculation has been provided in the next few pages.

SECTION 17 TOWNSHIP 14N RANGE 02W

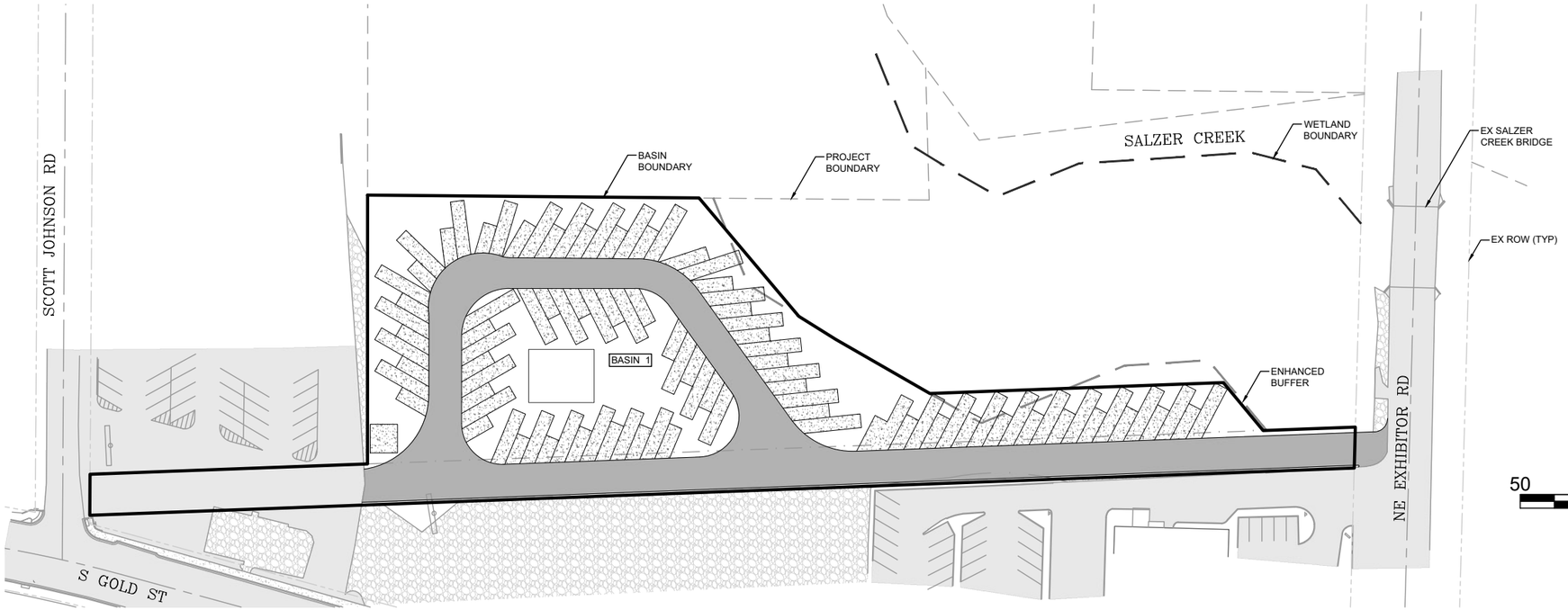


PRE DEVELOPED CONDITION:

BASIN 1

FOREST FLAT = 2.28 AC.

TOTAL BASIN 1 = 2.28 AC



POST DEVELOPED CONDITION:

BASIN 1

PASTURE FLAT = 0.66 AC
ASPHALT PAVEMENT = 0.84 AC
CONCRETE PAVEMENT = 0.74 AC
ROOF = 0.04 AC

TOTAL BASIN 1 = 2.28 AC

50 0 25 50 100

SCALE 1" = 50'

PRELIMINARY
FOR PERMIT ONLY

DRAWING TITLE: BASIN MAP

SCALE: 1:100 | DATE: 3/8/22 | DRAWN: SD | CHECKED: MF

PROJECT NAME: HICKS RV PARK

03/14/2022

AARON L. FULLER
STATE OF WASHINGTON
49455
REGISTERED
PROFESSIONAL ENGINEER

Exp. 03/17/2022

FULLER DESIGNS
1101 KRESKY AVE
CENTRALIA, WA 98531
(360) 807-4420

REV:	DESCRIPTION:	DATE:
1	ISSUED FOR CONSTRUCTION	3/8/22

BSN

1 OF 1

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	2140 BASIN 1
Site Name:	HICKS RV PARK
Site Address:	SCOTTT-JOHNSON ROAD
City:	Chehalis
Report Date:	3/7/2022
Gage:	Olympia
Data Start:	1955/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	0.800
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	2.28
Pervious Total	2.28
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.28

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Flat	0.66
Pervious Total	0.66

Impervious Land Use	acre
ROADS FLAT	1.58
Impervious Total	1.58
Basin Total	2.24

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	8.00 ft.	
Bottom Width:	180.00 ft.	
Depth:	4 ft.	
Volume at riser head:	0.0999 acre-feet.	← Required Facility Volume
Infiltration On		
Infiltration rate:	13.9	
Infiltration safety factor:	1	
Wetted surface area On		
Total Volume Infiltrated (ac-ft.):		264.092
Total Volume Through Riser (ac-ft.):		0
Total Volume Through Facility (ac-ft.):		264.092
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0.905
Side slope 1:	0 To 1	
Side slope 2:	0 To 1	
Side slope 3:	0 To 1	
Side slope 4:	0 To 1	
Discharge Structure		
Riser Height:	3 ft.	
Riser Diameter:	24 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

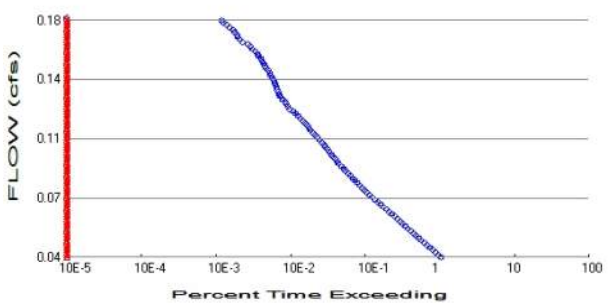
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.033	0.000	0.000	0.000
0.0444	0.033	0.001	0.000	0.463
0.0889	0.033	0.002	0.000	0.463
0.1333	0.033	0.004	0.000	0.463
0.1778	0.033	0.005	0.000	0.463
0.2222	0.033	0.007	0.000	0.463
0.2667	0.033	0.008	0.000	0.463
0.3111	0.033	0.010	0.000	0.463
0.3556	0.033	0.011	0.000	0.463
0.4000	0.033	0.013	0.000	0.463
0.4444	0.033	0.014	0.000	0.463
0.4889	0.033	0.016	0.000	0.463
0.5333	0.033	0.017	0.000	0.463
0.5778	0.033	0.019	0.000	0.463
0.6222	0.033	0.020	0.000	0.463
0.6667	0.033	0.022	0.000	0.463
0.7111	0.033	0.023	0.000	0.463
0.7556	0.033	0.025	0.000	0.463
0.8000	0.033	0.026	0.000	0.463
0.8444	0.033	0.027	0.000	0.463
0.8889	0.033	0.029	0.000	0.463
0.9333	0.033	0.030	0.000	0.463
0.9778	0.033	0.032	0.000	0.463
1.0222	0.033	0.033	0.000	0.463
1.0667	0.033	0.035	0.000	0.463
1.1111	0.033	0.036	0.000	0.463

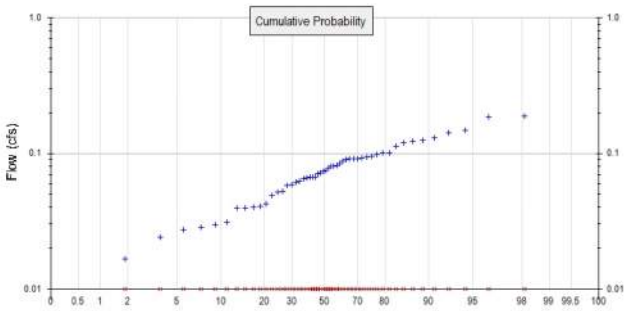
1.1556	0.033	0.038	0.000	0.463
1.2000	0.033	0.039	0.000	0.463
1.2444	0.033	0.041	0.000	0.463
1.2889	0.033	0.042	0.000	0.463
1.3333	0.033	0.044	0.000	0.463
1.3778	0.033	0.045	0.000	0.463
1.4222	0.033	0.047	0.000	0.463
1.4667	0.033	0.048	0.000	0.463
1.5111	0.033	0.050	0.000	0.463
1.5556	0.033	0.051	0.000	0.463
1.6000	0.033	0.052	0.000	0.463
1.6444	0.033	0.054	0.000	0.463
1.6889	0.033	0.055	0.000	0.463
1.7333	0.033	0.057	0.000	0.463
1.7778	0.033	0.058	0.000	0.463
1.8222	0.033	0.060	0.000	0.463
1.8667	0.033	0.061	0.000	0.463
1.9111	0.033	0.063	0.000	0.463
1.9556	0.033	0.064	0.000	0.463
2.0000	0.033	0.066	0.000	0.463
2.0444	0.033	0.067	0.000	0.463
2.0889	0.033	0.069	0.000	0.463
2.1333	0.033	0.070	0.000	0.463
2.1778	0.033	0.072	0.000	0.463
2.2222	0.033	0.073	0.000	0.463
2.2667	0.033	0.074	0.000	0.463
2.3111	0.033	0.076	0.000	0.463
2.3556	0.033	0.077	0.000	0.463
2.4000	0.033	0.079	0.000	0.463
2.4444	0.033	0.080	0.000	0.463
2.4889	0.033	0.082	0.000	0.463
2.5333	0.033	0.083	0.000	0.463
2.5778	0.033	0.085	0.000	0.463
2.6222	0.033	0.086	0.000	0.463
2.6667	0.033	0.088	0.000	0.463
2.7111	0.033	0.089	0.000	0.463
2.7556	0.033	0.091	0.000	0.463
2.8000	0.033	0.092	0.000	0.463
2.8444	0.033	0.094	0.000	0.463
2.8889	0.033	0.095	0.000	0.463
2.9333	0.033	0.097	0.000	0.463
2.9778	0.033	0.098	0.000	0.463
3.0222	0.033	0.099	0.070	0.463
3.0667	0.033	0.101	0.365	0.463
3.1111	0.033	0.102	0.784	0.463
3.1556	0.033	0.104	1.297	0.463
3.2000	0.033	0.105	1.886	0.463
3.2444	0.033	0.107	2.537	0.463
3.2889	0.033	0.108	3.239	0.463
3.3333	0.033	0.110	3.979	0.463
3.3778	0.033	0.111	4.745	0.463
3.4222	0.033	0.113	5.525	0.463
3.4667	0.033	0.114	6.307	0.463
3.5111	0.033	0.116	7.078	0.463
3.5556	0.033	0.117	7.826	0.463
3.6000	0.033	0.119	8.540	0.463
3.6444	0.033	0.120	9.208	0.463
3.6889	0.033	0.121	9.823	0.463

3.7333	0.033	0.123	10.37	0.463
3.7778	0.033	0.124	10.86	0.463
3.8222	0.033	0.126	11.29	0.463
3.8667	0.033	0.127	11.65	0.463
3.9111	0.033	0.129	11.96	0.463
3.9556	0.033	0.130	12.22	0.463
4.0000	0.033	0.132	12.46	0.463
4.0444	0.033	0.133	12.87	0.463

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.28
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.66
Total Impervious Area: 1.58

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.07133
5 year	0.109108
10 year	0.132262
25 year	0.15898
50 year	0.17706
100 year	0.193681

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.087	0.000
1957	0.119	0.000
1958	0.040	0.000
1959	0.051	0.000
1960	0.095	0.000
1961	0.072	0.000
1962	0.024	0.000
1963	0.101	0.000
1964	0.074	0.000
1965	0.062	0.000

1966	0.040	0.000
1967	0.080	0.000
1968	0.058	0.000
1969	0.031	0.000
1970	0.066	0.000
1971	0.083	0.000
1972	0.123	0.000
1973	0.067	0.000
1974	0.049	0.000
1975	0.113	0.000
1976	0.091	0.000
1977	0.017	0.000
1978	0.071	0.000
1979	0.091	0.000
1980	0.066	0.000
1981	0.094	0.000
1982	0.062	0.000
1983	0.100	0.000
1984	0.080	0.000
1985	0.027	0.000
1986	0.126	0.000
1987	0.141	0.000
1988	0.041	0.000
1989	0.052	0.000
1990	0.148	0.000
1991	0.186	0.000
1992	0.043	0.000
1993	0.030	0.000
1994	0.029	0.000
1995	0.082	0.000
1996	0.131	0.000
1997	0.074	0.000
1998	0.064	0.000
1999	0.090	0.000
2000	0.092	0.000
2001	0.014	0.000
2002	0.092	0.000
2003	0.039	0.000
2004	0.058	0.000
2005	0.067	0.000
2006	0.098	0.000
2007	0.078	0.000
2008	0.188	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1878	0.0000
2	0.1855	0.0000
3	0.1475	0.0000
4	0.1414	0.0000
5	0.1307	0.0000
6	0.1255	0.0000
7	0.1235	0.0000
8	0.1193	0.0000
9	0.1131	0.0000
10	0.1011	0.0000
11	0.1004	0.0000

12	0.0977	0.0000
13	0.0954	0.0000
14	0.0938	0.0000
15	0.0921	0.0000
16	0.0918	0.0000
17	0.0913	0.0000
18	0.0911	0.0000
19	0.0901	0.0000
20	0.0871	0.0000
21	0.0834	0.0000
22	0.0816	0.0000
23	0.0805	0.0000
24	0.0802	0.0000
25	0.0782	0.0000
26	0.0744	0.0000
27	0.0741	0.0000
28	0.0719	0.0000
29	0.0710	0.0000
30	0.0671	0.0000
31	0.0666	0.0000
32	0.0663	0.0000
33	0.0662	0.0000
34	0.0645	0.0000
35	0.0620	0.0000
36	0.0616	0.0000
37	0.0584	0.0000
38	0.0578	0.0000
39	0.0521	0.0000
40	0.0514	0.0000
41	0.0487	0.0000
42	0.0426	0.0000
43	0.0407	0.0000
44	0.0402	0.0000
45	0.0396	0.0000
46	0.0393	0.0000
47	0.0309	0.0000
48	0.0297	0.0000
49	0.0286	0.0000
50	0.0274	0.0000
51	0.0239	0.0000
52	0.0166	0.0000
53	0.0141	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0357	19217	0	0	Pass
0.0371	17694	0	0	Pass
0.0385	16165	0	0	Pass
0.0399	14870	0	0	Pass
0.0414	13637	0	0	Pass
0.0428	12511	0	0	Pass
0.0442	11465	0	0	Pass
0.0457	10459	0	0	Pass
0.0471	9593	0	0	Pass
0.0485	8861	0	0	Pass
0.0499	8166	0	0	Pass
0.0514	7532	0	0	Pass
0.0528	6940	0	0	Pass
0.0542	6397	0	0	Pass
0.0557	5902	0	0	Pass
0.0571	5447	0	0	Pass
0.0585	4999	0	0	Pass
0.0599	4555	0	0	Pass
0.0614	4193	0	0	Pass
0.0628	3864	0	0	Pass
0.0642	3572	0	0	Pass
0.0657	3263	0	0	Pass
0.0671	2972	0	0	Pass
0.0685	2730	0	0	Pass
0.0699	2505	0	0	Pass
0.0714	2308	0	0	Pass
0.0728	2117	0	0	Pass
0.0742	1953	0	0	Pass
0.0757	1802	0	0	Pass
0.0771	1671	0	0	Pass
0.0785	1558	0	0	Pass
0.0799	1448	0	0	Pass
0.0814	1346	0	0	Pass
0.0828	1256	0	0	Pass
0.0842	1169	0	0	Pass
0.0857	1096	0	0	Pass
0.0871	1012	0	0	Pass
0.0885	949	0	0	Pass
0.0899	886	0	0	Pass
0.0914	824	0	0	Pass
0.0928	785	0	0	Pass
0.0942	738	0	0	Pass
0.0957	694	0	0	Pass
0.0971	653	0	0	Pass
0.0985	610	0	0	Pass
0.0999	577	0	0	Pass
0.1014	544	0	0	Pass
0.1028	519	0	0	Pass
0.1042	491	0	0	Pass
0.1056	453	0	0	Pass
0.1071	423	0	0	Pass
0.1085	395	0	0	Pass
0.1099	367	0	0	Pass

0.1114	347	0	0	Pass
0.1128	326	0	0	Pass
0.1142	309	0	0	Pass
0.1156	289	0	0	Pass
0.1171	271	0	0	Pass
0.1185	250	0	0	Pass
0.1199	231	0	0	Pass
0.1214	216	0	0	Pass
0.1228	201	0	0	Pass
0.1242	179	0	0	Pass
0.1256	170	0	0	Pass
0.1271	160	0	0	Pass
0.1285	154	0	0	Pass
0.1299	142	0	0	Pass
0.1314	136	0	0	Pass
0.1328	132	0	0	Pass
0.1342	126	0	0	Pass
0.1356	122	0	0	Pass
0.1371	120	0	0	Pass
0.1385	116	0	0	Pass
0.1399	113	0	0	Pass
0.1414	109	0	0	Pass
0.1428	104	0	0	Pass
0.1442	100	0	0	Pass
0.1456	97	0	0	Pass
0.1471	93	0	0	Pass
0.1485	87	0	0	Pass
0.1499	84	0	0	Pass
0.1514	81	0	0	Pass
0.1528	77	0	0	Pass
0.1542	74	0	0	Pass
0.1556	69	0	0	Pass
0.1571	67	0	0	Pass
0.1585	62	0	0	Pass
0.1599	57	0	0	Pass
0.1613	53	0	0	Pass
0.1628	50	0	0	Pass
0.1642	42	0	0	Pass
0.1656	39	0	0	Pass
0.1671	36	0	0	Pass
0.1685	35	0	0	Pass
0.1699	33	0	0	Pass
0.1713	32	0	0	Pass
0.1728	28	0	0	Pass
0.1742	26	0	0	Pass
0.1756	23	0	0	Pass
0.1771	22	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.2234 acre-feet
On-line facility target flow:	0.2339 cfs.
Adjusted for 15 min:	0.2339 cfs.
Off-line facility target flow:	0.1322 cfs.
Adjusted for 15 min:	0.1322 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	240.32			☐	100.00			
Total Volume Infiltrated		240.32	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

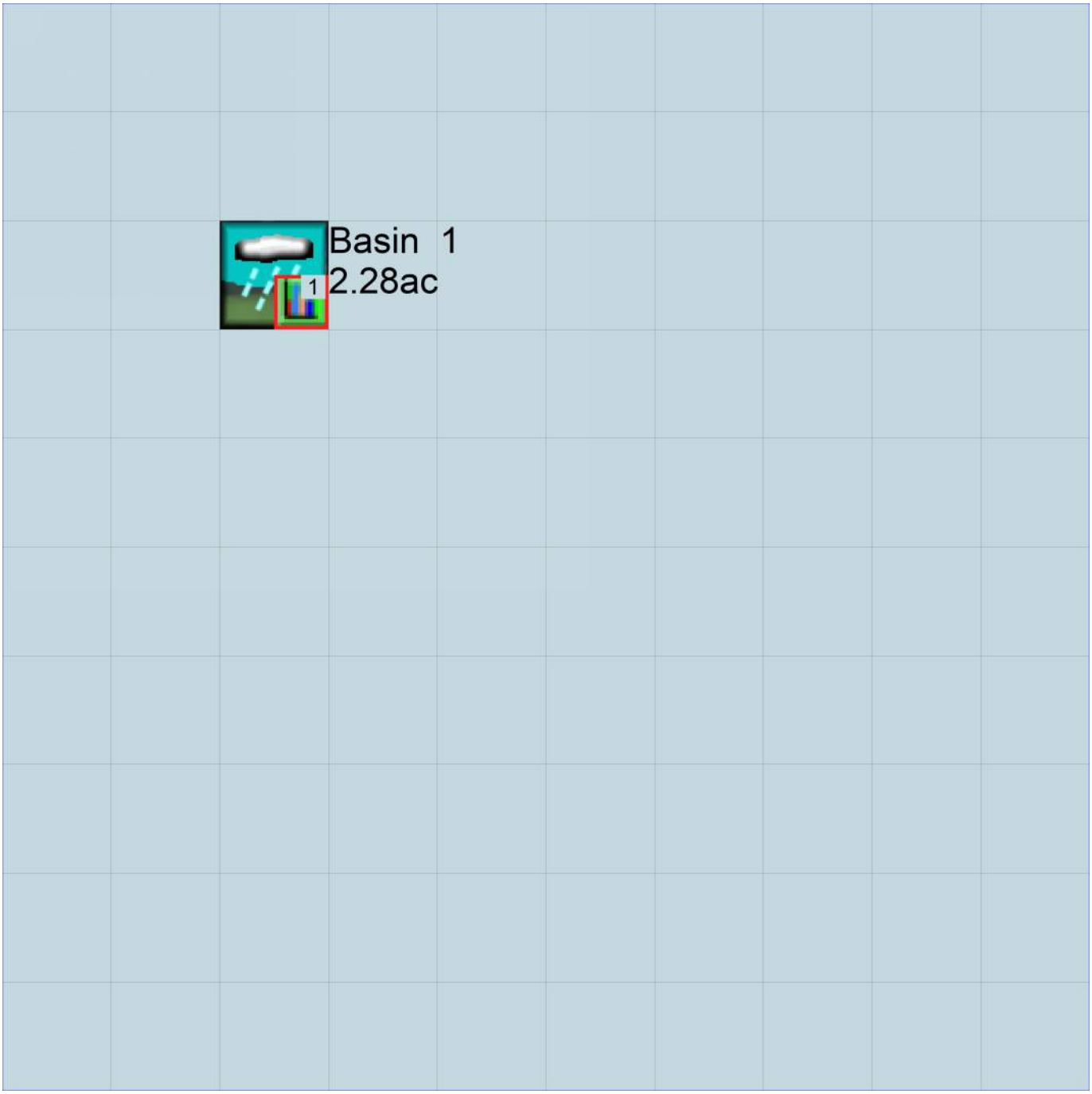
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

SECTION 6 – CONSTRUCTION SWPPP

This project is required to prepare a construction Storm Water Pollution Prevention Plan in accordance with Minimum Requirement #2 and must be prepared in accordance with Volume II chapter 3 of the SWMMWW.

This drainage and erosion control report is intended to supplement the construction SWPPP by utilizing other sections in this report to cover required narrative elements. Also, the construction and erosion control plans supplied for the project are to act as the required drawing component of the construction SWPPP.

Intended BMPs which should be used during construction include but are not limited to:

- BMP C101: Preserving Natural Vegetation
- BMP C102: Buffer Zones
- BMP C105: Stabilized Construction Entrance / Exit
- BMP C120: Temporary and Permanent Seeding
- BMP C140: Dust Control
- BMP C153: Material Delivery, Storage and Containment
- BMP C160: Certified Erosion and Sediment Control Lead
- BMP C162: Scheduling
- BMP C233: Silt Fence

General Requirements

Clearing and grading activities for this project shall be permitted only to the approved site development plan. These clearing and grading areas were established to preserve sensitive areas, buffers, native growth protection easements, and tree retention areas. These areas are delineated on the site plans and shall be marked on the development site.

The SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. Sediment and Erosion control BMPs shall be consistent with the BMPs contained in chapters 3 and 4 of Volume II of the SWMMWW.

Seasonal Work Limitations - From October 15 through April 1, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

1. Site conditions including existing vegetative coverage, slope, soil type and proximity to receiving waters.
2. Limitations on activities and the extent of disturbed areas.
3. Proposed erosion and sediment control measures.

Project Requirements - Construction SWPPP Elements

In most cases, all the following elements shall apply and be implemented throughout construction. Self-contained sites (discharges only to groundwater) must comply with all elements except for Element 3: Control Flow Rates.

Element 1: Preserve Vegetation/Mark Clearing Limits

- Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.
- Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable.

Element 2: Establish Construction Access

- Limit construction vehicle access and exit to one route, if possible.
- Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking of sediment onto public roads.
- Locate wheel wash or tire baths on site. If the stabilized construction entrance is not effective in preventing tracking sediment onto roads.
- If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area.
- Conduct street washing only after sediment is removed in accordance with the above bullet.

- Control street wash wastewater by pumping back on-site, or otherwise prevent it from discharging into systems tributary to waters of the State.

Element 3: Control Flow Rates

- Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site.
- Where necessary to comply with the bullet above, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (e.g. impervious surfaces).
- If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

Element 4: Install Sediment Controls

- Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.
- Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.
- Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP but must meet the flow control performance standard in Element #3, bullet #1.
- Locate BMPs intended to trap sediment on-site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.
- Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

Element 5: Stabilize Soils

- Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.
- Control stormwater volume and velocity within the site to minimize soil erosion.
- Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.
- Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:
    - During the dry season (April 2 – October 14): 7 days

    - During the wet season (October 15 - April 1): 2 days
    - Note that projects performing work under a NPDES Construction Stormwater General Permit issued by Ecology will have more restrictive time periods.
- Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.
- Stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways and drainage channels.
- Minimize the amount of soil exposed during construction activity.
- Minimize the disturbance of steep slopes.
- Minimize soil compaction and, unless infeasible, preserve topsoil.

Element 6: Protect Slopes

- Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).
- Divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.
- At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.
- Place excavated material on the uphill side of trenches, consistent with safety and space considerations.
- Place check dams at regular intervals within constructed channels that are cut down a slope.

Element 7: Protect Drain Inlets

- Protect all storm drain inlets made operable during construction so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.
- Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

Element 8: Stabilize Channels and Outlets

- Design, construct, and stabilize all on-site conveyance channels.
- Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches at the outlets of all conveyance systems.

Element 9: Control Pollutants

- Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.

- Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.
- Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest take within the containment structure. Double-walled tanks do not require additional secondary containment.
- Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.
- Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland application, or to the sanitary sewer, with local sewer district approval.
- Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.
- Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters.
- Adjust the pH of stormwater if necessary to prevent violations of water quality standards.
- Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.
- Obtain written approval from Ecology before using chemical treatment other than CO2 or dry ice to adjust pH.

Element 10: Control De-Watering

- Discharge foundation, vault, and trench de-watering water, which has similar characteristics to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.
- Discharge clean, non-turbid de-watering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.
- Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.
- Other treatment or disposal options may include:
    1. Infiltration.

2. Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.
3. Ecology-approved on-site chemical treatment or other suitable treatment technologies.
4. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.
5. Use of a sedimentation bag that discharges to a ditch or swale for small volumes of localized dewatering.

Element 11: Maintain BMPs

- Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.
- Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

Element 12: Manage the Project

- Phase development projects to the maximum degree practicable and consider seasonal work limitations.
- Inspection and monitoring – Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit must conduct site inspections and monitoring in accordance with Special Condition S4 of the Construction Stormwater General Permit.
- Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP.
- Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By the initiation of construction, the SWPPP must identify the CESCL or inspector, who must be present onsite or on-call at all times.
- The CESCL or inspector (project sites less than one acre) must have the skills to assess the:
    - Site conditions and construction activities that could impact the quality of stormwater.
    - Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- The CESCL or inspector must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. They must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.
- Based on the results of the inspection, construction site operators must correct the problems identified by:
    - Reviewing the SWPPP for compliance with the 13 construction SWPPP elements and making appropriate revisions within seven (7) calendar days of the inspection.
- Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems not

later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, the construction site operator may request an extension within the initial 10day response period.

- Documenting BMP implementation and maintenance in the site log book (sites larger than 1 acre).
- The CESCL or inspector must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The CESCL or inspector may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month.

Element 13: Protect Low Impact Development BMPs

- Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.
- Prevent compacting Bioretention and rain garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.
- Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials.
- Pavement fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures in accordance with this manual or the manufacturer's procedures.
- Keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.

SECTION 7 – SPECIAL REPORTS AND STUDIES

A soils report from the NRCS USDA web soil survey website has been included on the next pages. Also, a geotechnical report, a cultural resource assessment and a critical areas report were performed and are included as well.

Map Scale: 1:1,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lewis County Area, Washington
Survey Area Data: Version 21, Aug 31, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2021—Nov 22, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
172	Reed silty clay loam	4.1	96.3%
247	Xerorthents, spoils	0.2	3.7%
Totals for Area of Interest		**4.3**	**100.0%**

10/13/2021

Fuller Designs
1101 Kresky Ave
Centralia, WA

Subject: **Geotechnical Services Report**
Hick RV Park- Geotechnical Investigation
TPN 005605080007, 0 Exhibitor Rd, Chehalis, WA
Project Number: QG21-104

Dear Client:

At your request, Quality Geo NW, PLLC (QG) has completed a soils investigation of the above referenced project. The investigation was performed in accordance with our proposal for professional services.

We would be pleased to continue our role as your geotechnical consultant of record during the project planning and construction phases, as local inspection firms have not been found to be as familiar or reliably experienced with geotechnical design. This may include soil subgrade inspections, periodic review of special inspection reports, or supplemental recommendations if changes occur during construction. We will happily meet with you at your convenience to discuss these and other additional *Time & Materials* services.

We thank you for the opportunity to be of service on this project and trust this report satisfies your project needs currently. QG wishes you the best while completing the project.

Respectfully Submitted,
Quality Geo NW, PLLC

Luke P.

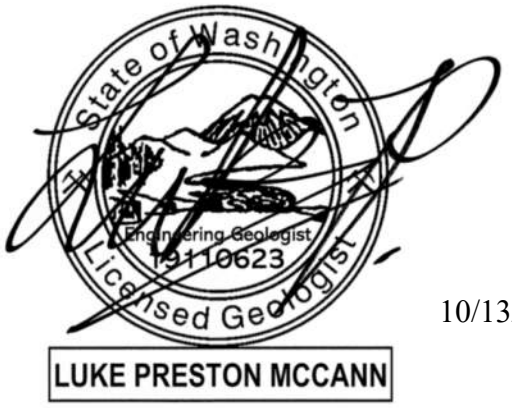
Luke Preston McCann, L.E.G.
Owner + Principal

SOILS REPORT

HICK RV PARK
TPN 005605080007, 0 EXHIBITOR RD
CHEHALIS, WA

Fuller Designs
1101 Kresky Ave
Centralia, WA

Prepared by:



10/13/2021

Ray Gean
Staff Geologist

Luke Preston McCann, L.E.G.
Principal Licensed Engineering Geologist

Quality Geo NW, PLLC
Geotechnical Investigation & Engineering Consultation
Phone: 360-878-9750 | Web: qualitygeonw.com
Mail: 420 Golf Club Rd SE, Ste 203, Lacey, WA 98503

10/13/2021

QG Project # QG21-104

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the findings and recommendations of Quality Geo NW's (QG) soil investigation conducted in support of new site surface improvements.

1.1 PROJECT DESCRIPTION

QG understands the project entails development of the site as a recreational vehicle(RV) park, including new paving of the site. Exterior improvements are anticipated to include infrastructure for auto access and parking, flatworks, and other necessary site amenities. QG has been contracted to perform a soils investigation of the proposed site to provide stormwater and earthwork recommendations.

1.2 FIELD WORK

Site exploration activities were performed on 9/8/2021. Exploration locations were marked in the field by a QG Staff Geologist with respect to the provided map and cleared for public conductible utilities. Our exploration locations were selected by an QG Staff Geologist prior to field work to provide safest access to relevant soil conditions. The geologist directed the advancement of 3 excavated test pits (TP). The test pits were advanced within the vicinity of the anticipated development footprint areas, to depths of 10.0 feet below present grade (BPG) in general accordance with the specified contract depth.

During explorations QG logged each soil horizon we encountered, and field classified them in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected from each unit, identified according to boring location and depth, placed in plastic bags to protect against moisture loss, and were transported to the soil laboratory for supplemental classification and other tests.

QG advanced 1 Wildcat Dynamic Cone Penetrometer (DCP) tests at a representative location within the vicinity of a proposed footprint as conditions permitted. The penetrometer test was terminated upon reaching the equipment's maximum practical extent. During penetrometer advancement, blow counts were recorded in 10-centimeter increments as a thirty-five-pound weight was dropped a distance of 15 inches. Blow counts were then converted to resistance (kg/cm^2), standard penetration blow counts (N-values), and corresponding soil consistency, with complete results shown on the attached logs.

2.0 EXISTING SITE CONDITIONS

2.1 AREA GEOLOGY

QG reviewed available map publications to assess known geologic conditions and hazards present at the site location. The Washington Geologic Information Portal (WGIP), maintained by the Department of Natural Resources Division of Geology and Earth Resources, provides 1:100,000-scale geologic mapping of the region. Geology of the site location and vicinity consists of continental Quaternary alluvium deposits (Qa). The alluvium on site is described as typically Silt, sand, and gravel deposited in streambeds and fans; surface relatively undissected. The WGIP Map also offers layers of mapped geohazard conditions within the state. According to the regional-scale interactive map, no known geohazards are mapped for the site.

The United States Department of Agriculture portal (USDA), provides a soil mapping of the region. The soils in the vicinity are mapped as Reed Silty Clay Loam (172), these are formed by flood plains and terraces. The soils are described as silty clay loam from 0 to 14 inches, and clay from 14 to 60+ inches. Depth to restrictive feature is more than 80 inches. Capacity of most limiting layer to transmit water (ksat), is listed as moderately low to moderately high (0.06 to 0.20 in/hr). Depth to water table is about 18 to 36 inches.

2.2 SITE & SURFACE CONDITIONS

The project area is relatively flat, near the same elevation as the adjacent road, The site is currently undeveloped, within the parcel, and mostly grasses.

2.3 SOIL LOG

Site soil conditions were generally identical across the property in all 3 test pits. Representative lab samples were taken from TP-1. Soil conditions on site were as follows:

- **0.0’ to 1.0’ – Topsoil:**

  An overriding 12-inch layer of topsoil was present over the site.

- **1.0’ to 5.0’ – Poorly Graded Sand (SP)**

  Beneath topsoil, was approximately a 4.0-foot layer of grey-brown organic layer, which medium dense to dense.

- **5.0’ to 10’ Well Graded Sand (SW)**

  Beneath sand with gravel, native sediments resemble a gray fine sandy outwash, with minimal fines content and occasional cobble content, in a typically medium dense condition. Soils within the central and south portion (TP-2,TP-3) of the site were the same

as TP-1. No groundwater was encountered within this unit or any test pits down to maximum depth of 10 feet below present grade.

2.4 SURFACE WATER AND GROUNDWATER CONDITIONS

No active surface water features are present on site. During our test pit explorations, no pervasive groundwater table was encountered. This groundwater table is inferred to exist at approximately 40 feet beneath the entire site, based on well logs made publically available by the WA Department of Ecology. Due to the time of year, it may be assumed that the explorations did not occur during the seasonal high, and the water table may raise during the mid-winter months.

QG's scope of work did not include determination or monitoring of seasonal groundwater elevation variations, formal documentation of wet season site conditions, or conclusive measurement of groundwater elevations at depths past the extent feasible for explorations at the time of the field explorations.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 SHALLOW FOUNDATION RECOMMENDATIONS

QG recommends excavating loose or organic cover soils down to firm bearing conditions expected within 0.5 feet from the surface. As the variability in subgrade support between consolidated glacial deposits and weathered medium dense cover soils may result in differential settlement, QG recommends that foundations be placed on compacted native soils wherever, or on firm structural fill installed over these compacted soils to achieve footing grade.

Assuming site preparation is completed as described above, we recommend the following:

- **Subgrade Preparation**

  QG recommends excavating and clearing any loose or organic cover soils, including the thin overriding layer of topsoil where necessary, from areas of proposed pavement construction, down to firm bearing conditions and benching the final bottom of subgrade elevation flat. Excavations should be performed with a smooth blade bucket to limit disturbance of subgrade soils. Vibratory compaction methods are suitable for densification of the non-organic native soils.

  After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the periodic guidance of a QG representative. Any areas that are identified as being soft or yielding during subgrade evaluation should be brought to the attention of the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

  The proposed buildings may utilize either stepped or continuous footings with slab-on-grade elements. For continuous footing elements, upon reaching bearing strata, we recommend benching foundation lines flat. Continuous perimeter and strip foundations may be stepped as needed to accommodate variations in final subgrade level. We also recommend maximum steps of 18 inches with spacing of at least 5 feet be constructed unless specified otherwise by the design engineer. Structural fill may then be placed as needed to reestablish final foundation grade.

- **Allowable Bearing Capacity:**

  Up to 1,500 pounds per square foot (psf) for foundations placed on compacted native soil or on approved structural fill soils placed in accordance with the recommendations of *Section 4.2*. Bearing capacities, at or below 1,500 psf may eliminate the need for additional inspection

requirements if approved by the county. The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**

  For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. However, all footings must also penetrate to the prescribed bearing stratum cited above. Minimum depths are referenced per IBC requirements for frost protection; other design concerns may dictate greater values be applied.

- **Minimum Footing Width:**

  Footings should be proportioned to meet the stated bearing capacity and/or the IBC 2012 (or current) minimum requirements. For a shallow perimeter and spread footing system, continuous strip footings should be a minimum of 16 inches wide and interior or isolated column footings should be a minimum of 24 inches wide.

- **Estimated Settlements:**

  All concrete settles after placement. We estimate that the maximum settlements will be on the order of 0.5 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur soon after the load is applied during construction.

3.1.1 BUILDING SLAB ON GRADE FLOOR

QG anticipates that slab-on-grade floors are planned for the interior of the proposed building. Based on typical construction practices, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, QG should be contacted to provide revised or alternative recommendations.

- **Capillary Break:**

  A capillary break will be helpful to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, or to substitute for a structural fill base pad where specified, QG recommends the capillary break should consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with *Section 5.2.2* of this report.

- **Vapor Barrier:**

  A vapor retarding membrane such as 10 mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture where floor coverings may be affected. Care should be taken during construction not to puncture or damage the membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired. If excessive relict organic fill material is discovered at any location, additional sealant or more industrial gas barriers may be required to prevent off-gassing of decaying material from infiltrating the new structure. These measures shall be determined by the structural engineer to meet local code requirements as necessary.

- **Structural Design Considerations:**

  QG assumes design and specifications of slabs will be assessed by the project design engineer. We suggest a minimum unreinforced concrete structural section of 4.0 inches be considered to help protect against cracking and localized settlement, especially where larger equipment or localized loads are anticipated. It is generally recommended that any floor slabs and annular exterior concrete paving subject to vehicular loading be designed to incorporate reinforcing. Additionally, some level of reinforcing, such as a wire mesh may be desirable to prolong slab life due to the overwhelming presence of such poor underlying soils. It should be noted that QG does not express any guarantee or warranty for proposed slab sections.

3.2 INFILTRATION RATE DETERMINATION

QG understands design of on-site stormwater controls are pending the results of this study to confirm design parameters and interpreted depths to perched seasonal groundwater and restrictive soil features.

3.2.1 GRADATION ANALYSIS METHODS & RESULTS

During test pit excavations for general site investigation, QG additionally collected representative samples of native soil deposits among potential infiltration strata and depths. Representative soil samples were selected from the northwest corner of the site (where an infiltration pond is proposed) to characterize the local infiltration conditions.

We understand the project will be subject to infiltration design based on the Washington Department of Ecology Stormwater Management Manual for Western Washington (DoE SMMWW). For initial site infiltration characterization within the scope of this study, laboratory gradation analyses were completed including sieve and hydrometer tests for stormwater design characterization and rate determination to supplement field observations. Results of laboratory testing in terms of rate calculation are summarized below.

Laboratory results were interpreted to recommended design inputs in accordance with methods of the 2019 DoE SMMWW. Gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity.

(1) $\log10(Ksat) = -1.57 + 1.90*D10 + 0.015*D60 - 0.013*D90 - 2.08*ff$

Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized site-wide design situation, we have applied a site variability factor of CFv = 0.7 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

(2) $CFT = CFv \times CFt \times CFm = 0.7 \times 0.4 \times 0.9 = 0.25$

Results were cross-referenced with test pit logs to determine the validity and suitability of unique materials as an infiltration receptor. Additional reduction factors were applied for practical rate determination based on our professional judgement.

Table 1. Results Of Massmann Analysis

TP #	Sample Depth *(BPG)*	Unit Extent *(ft)*	Soil Type	D10	D60	D90	Fines (%)	Ksat *(in/hr)*	Corrected Ksat *(in/hr)*	LT Design Infiltration Rate*(in/hr)*	Cation Exchange Capacity (meq/100g)	Organic Content %
1	2.0	1' to 5'	SP	0.34	1.8	5.3	0.8	147.55	36.8	**20.0**	21.9	1.8
1	7.0	5' to 10'+	SW	0.13	1.5	3.3	3.0	55.68	13.92	**13.92**	19.1	3.0

Beneath topsoils, the lower brown to gray outwash soils were observed to generally exhibit minimal fines content and minimal oxidation patterns. In-ground infiltration structures are required to maintain a minimum separation from restrictive soil & groundwater features.

For in-ground infiltration galleries, we recommend a maximum design rate of up to 13.9 inch/hour be considered, **For any shallow infiltration features such as rain gardens, pervious pavement or swales, we recommend the designer consider a reduced rate of 4 inches per hour** which is typically suitable for most shallow infiltration features, and considers potential reductions from compaction during construction.

QG recommends the facility designer review these results and stated assumptions per reference literature to ensure applicability with the proposed development, level of anticipated controls, and long- term maintenance plan. The designer may make reasonable adjustments to correction factors and the resulting design values based on these criteria to ensure design and operational intent is met. We recommend that we be contacted if substantial changes to rate determination are considered.

3.2.2 TREATMENT POTENTIAL

Depending on stormwater and runoff sources, some stormwater features, such as rain gardens or pervious pavements may require treatment. Stormwater facilities utilizing native soils as treatment media typically require Cation Exchange Capacities (CEC) of greater than 5 milliequivalents per 100grams (meq/100g) and organic contents greater than 1% (this may vary depending on local code). The underlying sands did meet these treatment standards.

If the overall infiltration rate must be decreased to allow more treatment time, QG recommends placing a minimum 6" thick layer of ASTM c33 sand between the native soil and base of the infiltrating feature. This will typically reduce the infiltration rate to approximately 9in/hr and allow for proper treatment of stormwater within above treatment soils.

3.2.3 DRAINAGE RECOMMENDATIONS

QG recommends proper drainage controls for stormwater runoff during and after site development to protect the site. The ground surface adjacent to structures should be sloped to drain away at a 5% minimum to prevent ponding of water adjacent to them.

QG recommends all stormwater catchments (new or existing) be tightlined (piped) away from structures to an existing catch basin, stormwater system, established channel, or approved outfall to be released using appropriate energy-dissipating features at the outfall to minimize point erosion. Roof and footing drains should be tightlined separately or should be gathered in an appropriately sized catch basin structure and redistributed collectively. If storm drains are incorporated for impervious flatworks (driveways, sidewalks, etc.) collected waters should also be discharged according to the above recommendations. Based on our observations of a shallow groundwater table, appropriate measures should be taken by the site designer to consider and allow for an adequate emergency outfall location in the event of future record stormwater fall that cannot be anticipated.

3.3 IMPERVIOUS PAVEMENT CONSIDERATIONS

QG anticipates most pavements will be constructed of flexible Hot Mix Asphalt surfacing, with thickened sections for anticipated heavy load areas. The main entrance/exit drive will likely experience different traffic volumes than the far end of the pavement areas. As a result, consideration could be given to increasing the pavement section in the main entrance/exit drive. Pavement sections presented in the above table should not be used for areas which experience repeated truck traffic/parking, equipment or truck parking areas, entrances and exit aprons, or contain trash dumpster loading zones. In these areas, a Portland Cement Concrete (PCC) pavement should be used, as opposed to HMA.

One of the important considerations in designing a high quality and durable pavement is providing adequate drainage. Design of drainage for the proposed pavement section is outside of QG 's scope of work at this time. It is important that bird baths (leeching basins) and surface waves are not created during construction of the HMA layer. A proper slope should also be allowed, and drainage should be provided along the edges of pavements and around catch basins to prevent accumulation of free water within the base course, which otherwise may result in subgrade softening and pavement deterioration under exposure and repeated traffic conditions.

All pavements require regular maintenance and repair in order to maintain the serviceability of the pavement. These repairs and maintenance are due to normal wear and tear of the pavement surface and are required in order to extend the serviceability life of the pavement. However, after 10 years of service, a normal pavement structure is likely to deteriorate to a point where pavement rehabilitation may be required to maintain the serviceability. The deterioration is more likely if the pavement is constructed over poor subgrade soils or in area of higher traffic volumes.

Rigid pavement components are commonly utilized for portions of accesses and ancillary exterior improvements. The project civil designer may re-evaluate the below general recommendations for pavement thicknesses and base sections, if necessary, to ensure proper application to a given structure and use. QG recommends that we be contacted for further consultation if the below sections are proposed to be reduced.

Concrete driveway aprons and curb alignments, if utilized, should consist of a minimum 6-inch thickness of unreinforced concrete pavement over structural base fill. Base thickness should correspond to related location and anticipated traffic loading. For light traffic areas, a 6-inch minimum base thickness (total 12-inch section) can be applied. For heavy traffic zones, we recommend allotting a 12- inch minimum base section beneath the pavement, or the incorporation of reinforcing steel in the concrete.

Concrete sidewalks, walkways and patios if present may consist of a minimum 4-inch section of plain concrete (unreinforced) installed over a 6-inch minimum compacted base of crushed rock. At locations where grade has been raised with structural fill, a 4-inch minimum crushed rock section may be used. Flatworks should employ frequent joint controls to limit cracking potential.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 EARTHWORK

4.1.1 GRADING & EXCAVATION

A grading plan was not available to QG at the time of this report. However, based on provided conceptual plans, this study assumes finished site grade will approximate current grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths. Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators.

4.1.2 SUBGRADE EVALUATION & PREPARATION

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the part-time observation and guidance of an QG representative.

The special inspection firm should continuously evaluate all backfilling. Any areas that are identified as being soft or yielding during subgrade evaluation should be over excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over excavation is performed below a structure, the over excavation area should extend beyond the outside of the footing a distance equal to the depth of the over excavation below the footing. The over excavated areas should be backfilled with properly compacted structural fill.

4.1.3 SITE PREPARATION, EROSION CONTROLL, WET WEATHER

Any silty or organic rich native soils may be moisture-sensitive and become soft and difficult to traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect any exposed soil subgrades, limit construction traffic during earthwork activities, and limit machine use only to areas undergoing active preparation.

Once the geotechnical engineer has approved subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade. Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoff should be collected and disposed of properly. Measures may

also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air drying and soil amendment, etc.

QG recommends earthwork activities take place during the summer dry season.

4.2 STRUCTURAL FILL MATERIALS AND COMPACTION

4.2.1 MATERIALS

All material placed below structures or pavement areas should be considered structural fill. Excavated native soils may be considered suitable for reuse as structural fill on a case-by-case basis. Imported material can also be used as structural fill. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials. Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

Structural fill material shall be free of deleterious materials, have a maximum particle size of 4 inches, and be compactable to the required compaction level. Imported structural fill material should conform to the WSDOT manual Section 9-03.14(1) Gravel Borrow, or an approved alternative import material. Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Imported materials utilized for trench back fill shall conform to Section 9-03.19, Trench Backfill, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*. Imported materials utilize as grade fill beneath roads shall conform to WSDOT Section 9-03.10, Gravel Base.

Pipe bedding material should conform to the manufacturer's recommendations and be worked around the pipe to provide uniform support. Cobbles exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Soils with fines content near or greater than 10% fines content may likely be moisture sensitive and become difficult to use during wet weather. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials.

The contractor should submit samples of each of the required earthwork materials to the materials testing lab for evaluation and approval prior to delivery to the site. The samples should be

submitted **at least 5 days prior to their delivery** and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

4.2.2 FILL PLACEMENT AND COMPACTION

For lateral and bearing support, structural fill placement below footings shall extend at minimum a distance past each edge of the base of the footing equal to the depth of structural fill placed below the footing [i.e. extending at least a 1H:1V past both the interior and the exterior of the concrete footing].

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 12 inches in thickness. All structural fill shall be compacted to a firm and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

- Foundation and Floor Slab Subgrades: 95 Percent
- Pavement Subgrades & wall backfill (upper 2 feet): 95 Percent
- Pavement Subgrades & wall backfill (below 2 feet): 90 Percent
- Utility Trenches (upper 4 feet): 95 Percent
- Utility Trenches (below 4 feet): 90 Percent

A sufficient number of tests should be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent tests will be required while the contractor establishes the means and methods required to achieve proper compaction.

Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

4.3 TEMPORARY EXCAVATIONS AND TRENCHES

All excavations and trenches must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that QG is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred. The contractor shall be responsible for the safety of personnel working in utility trenches. Given that steep excavations in native soils may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in

accordance with state and federal safety regulations. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation.

Temporary excavations and trenches should be protected from the elements by covering with plastic sheeting or some other similar impermeable material. Sheeting sections should overlap by at least 12 inches and be tightly secured with sandbags, tires, staking, or other means to prevent wind from exposing the soils under the sheeting.

5.0 SPECIAL INSPECTION

The recommendations made in this report assume that an adequate program of tests and observations will be made throughout construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Geotechnical plan review and engineering consultation as needed prior to construction phase,
- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cutslopes and shoring if needed,
- Consultation as necessary during construction.

QG recommends that a local and reputable materials testing & inspection firm be retained for construction phase testing and observation in accordance with the local code requirements. We also strongly recommend that QG be retained as the project Geotechnical Engineering Firm of Record (GER) during the construction of this project to perform periodic supplementary geotechnical observations and review the special inspectors reports during construction.

Our knowledge of the project site and the design recommendations contained herein will be of great benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We would be pleased to meet with you at your convenience to discuss the *Time & Materials* scope and cost for these services.

6.0 LIMITATIONS

Upon acceptance and use of this report, and its interpretations and recommendations, the user shall agree to indemnify and hold harmless QG, including its owners, employees and subcontractors, from any adverse effects resulting from development and occupation of the subject site. Ultimately, it is the owner's choice to develop and live in such an area of possible geohazards (which exist in perpetuity across the earth in one form or another), and therefore the future consequences, both anticipated and unknown, are solely the responsibility of the owner. By using this report for development of the subject property, the owner must accept and understand that it is not possible to fully anticipate all inherent risks of development. The recommendations provided above are intended to reduce (but may not eliminate) such risks.

This report does not represent a construction specification or engineered plan and shall not be used or referenced as such. The information included in this report should be considered supplemental to the requirements contained in the project plans & specifications and should be read in conjunction with the above referenced information. The selected recommendations presented in this report are intended to inform only the specific corresponding subjects. All other requirements of the above-mentioned items remain valid, unless otherwise specified.

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, field observations and explorations, and laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, or If the scope of the proposed construction changes from that described in this report, QG should be notified immediately in order to review and provide supplemental recommendations.

The findings of this study are limited by the level of scope applied. We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the subject region. No warranty, expressed or implied, is made. The recommendations provided in this report assume that an adequate program of tests and observations will be conducted by a WABO approved special inspection firm during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the Client and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. It is the Client's responsibility to ensure that the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. Note that if another firm assumes Geotechnical Engineer of Record responsibilities, they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required. Based on the intended use of the report, QG may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release QG from any liability resulting from the use of this report. The Client, the design consultants, and any unauthorized party, agree to defend, indemnify, and hold harmless QG from any claim or liability associated with such unauthorized use or non-compliance. We recommend that QG be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

Appendix A. Region & Vicinity Maps

REGION

VICINITY

Quality Geo NW, PLLC	**Site Region** Hick RV Park	Source: Google Imagery, 2021 **Scale & Locations are approx.** **Not for Construction**	**Figure 1**

Appendix B. Exploration Map

Quality Geo NW, PLLC	**Site Map** Hick RV Park	Source: Lewis County GIS, 2021 **Scale & Locations are approx.** **Not for Construction**	**Figure 2**

Appendix C. Exploration Logs

TEST PIT LOG TP-1

PROJECT NUMBER QG21-104
PROJECT NAME Hicks RV Park
PROJECT LOCATION Chehalis, WA

FIELD WORK DATE 09/8/2021
DRILLING METHOD Excavated Test Pit

BORING LOCATION North part of the site
SURFACE ELEVATION Existing
LOGGED BY RG

COMMENTS

Depth (ft)	Samples	Is Analysed?	Graphic Log	USCS	Material Description
0.5				TS	TOPSOIL
1				SP	POORLY GRADED SAND. Grey-brown color, moist, organics, minor cobble up to 1 inch, medium dense to dense. Mottling at 1.0 feet Gravel %=11, Sand%=88, Fines%=<1
1.5					
2					
2.5					
3					
3.5					
4					
4.5					
5				SW	WELL GRADED SAND. Grey color, moist, minor organics, medium dense to dense, no cobble. Gravel%=3, Sand%=94, Fines%=3
5.5					
6					
6.5					
7					
7.5					
8					
8.5					
9					
9.5					
10					Termination Depth at 10.0 Feet. Terminated at Contracted Depth
10.5					

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TEST PIT LOG TP-2

PROJECT NUMBER QG21-104
PROJECT NAME Hicks RV Park
PROJECT LOCATION Chehalis, WA

FIELD WORK DATE 09/8/2021
DRILLING METHOD Excavated Test Pit

BORING LOCATION Center of the site
SURFACE ELEVATION Existing
LOGGED BY RG

COMMENTS

Depth (ft)	Samples	Is Analysed?	Graphic Log	USCS	Material Description
0				TS	TOPSOIL
1.5				SP	POORLY GRADED SAND. Grey-brown color, moist, organics, minor cobble up to 1 inch, medium dense to dense. Mottling at 1.0 feet Gravel %=11, Sand%=88, Fines%=<1
6				SW	WELL GRADED SAND. Grey color, moist, minor organics, medium dense to dense, no cobble. Gravel%=3, Sand%=94, Fines%=3
10					Termination Depth at 10.0 Feet. Terminated at Contracted Depth

TEST PIT LOG TP-3

PROJECT NUMBER QG21-104
PROJECT NAME Hicks RV Park
PROJECT LOCATION Chehalis, WA

FIELD WORK DATE 09/8/2021
DRILLING METHOD Excavated Test Pit

BORING LOCATION Southern part of the site
SURFACE ELEVATION Existing
LOGGED BY RG

COMMENTS

Depth (ft)	Samples	Is Analysed?	Graphic Log	USCS	Material Description
0				TS	TOPSOIL
1				SP	POORLY GRADED SAND. Grey-brown color, moist, organics, minor cobble up to 1 inch, medium dense to dense. Mottling at 1.0 feet Gravel %=11, Sand%=88, Fines%=<1
8				SW	WELL GRADED SAND. Grey color, moist, minor organics, medium dense to dense, no cobble. Gravel%=3, Sand%=94, Fines%=3
10					Termination Depth at 10.0 Feet. Terminated at Contracted Depth

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WILDCAT DYNAMIC CONE LOG

Quality Geo, PLLC
Geotechnical Consultants
Olympia, WA

PROJECT NUMBER: QG21-104
DATE STARTED: 09-08-2021
DATE COMPLETED: 09-08-2021

HOLE #: DCP-1
CREW: RG
PROJECT: Hicks RV Park
ADDRESS: 0 Exhibitor Rd
LOCATION: Chehalis, WA

SURFACE ELEVATION: Existing
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	25	111.0	••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	38	168.7	••	25+	DENSE	HARD
- 1 ft	36	159.8	••	25+	DENSE	HARD
-	34	151.0	•••	25+	DENSE	HARD
-	26	115.4	••••••••••••••••••••••••••••••••	25+	DENSE	HARD
- 2 ft	31	137.6	•••••••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	20	88.8	••••••••••••••••••••••••	25	MEDIUM DENSE	VERY STIFF
-	12	53.3	••••••••••••••	15	MEDIUM DENSE	STIFF
- 3 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 1 m	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	13	50.2	•••••••••••••	14	MEDIUM DENSE	STIFF
- 4 ft	16	61.8	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	12	46.3	•••••••••••••	13	MEDIUM DENSE	STIFF
- 5 ft	9	34.7	•••••••••	9	LOOSE	STIFF
-	8	30.9	••••••••	8	LOOSE	MEDIUM STIFF
-	9	34.7	•••••••••	9	LOOSE	STIFF
- 6 ft	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 2 m	4	15.4	••••	4	VERY LOOSE	SOFT
- 7 ft	4	13.7	•••	3	VERY LOOSE	SOFT
-	3	10.3	••	2	VERY LOOSE	SOFT
-	3	10.3	••	2	VERY LOOSE	SOFT
- 8 ft	2	6.8	•	1	VERY LOOSE	VERY SOFT
-	2	6.8	•	1	VERY LOOSE	VERY SOFT
-	6	20.5	•••••	5	LOOSE	MEDIUM STIFF
- 9 ft	10	34.2	•••••••••	9	LOOSE	STIFF
-	11	37.6	••••••••••	10	LOOSE	STIFF
-	11	37.6	••••••••••	10	LOOSE	STIFF
- 3 m 10 ft	11	37.6	••••••••••	10	LOOSE	STIFF
-	16	49.0	••••••••••••••	13	MEDIUM DENSE	STIFF
-	13	39.8	••••••••••••	11	MEDIUM DENSE	STIFF
-	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
- 11 ft	18	55.1	••••••••••••••••	15	MEDIUM DENSE	STIFF
-	20	61.2	••••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	17	52.0	••••••••••••••••	14	MEDIUM DENSE	STIFF
- 12 ft	21	64.3	••••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
-	25	76.5	••••••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
-	25	76.5	••••••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
- 4 m 13 ft	25	76.5	••••••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF

Appendix D. Laboratory Results

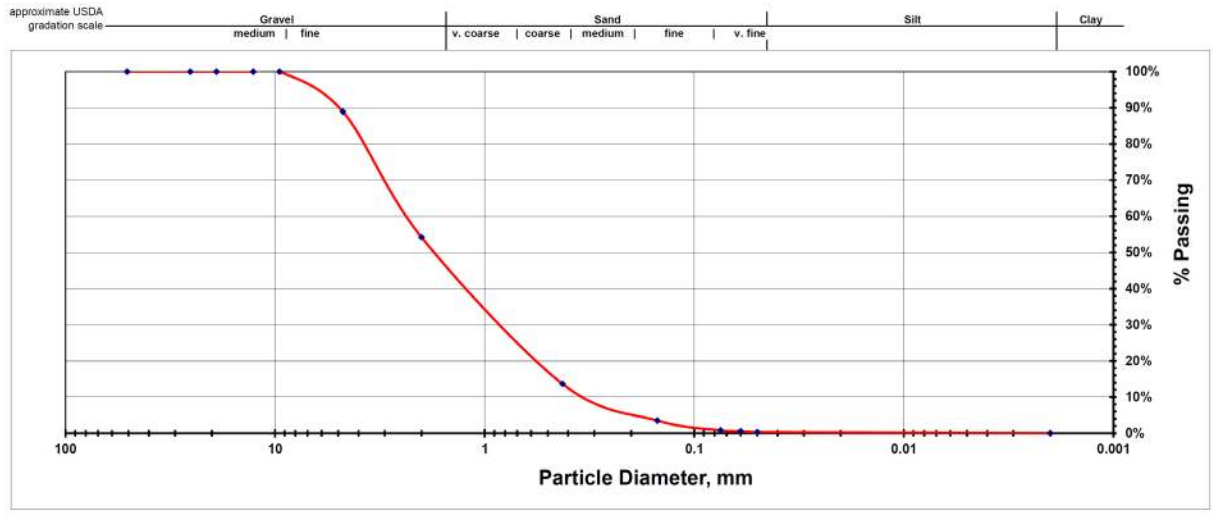
soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 · www.soiltestlab.com
Office: (509)765-1622 · Fax:(509)765-0314 · (800)764-1622

PARTICLE SIZE DISTRIBUTION REPORT

CLIENT: Quality Geo NW
PROJECT: HICKS RV QG21-104
Lab # S21-20947

Date Received 9/17/2021
Date Reported 10/4/2021
Test Method: ASTM D2487/ D 422

SAMPLE ID: TP-1 at 2'



description	CoCr	CoGr	MedGr	MedGr	MedGr	FiGr	vCoS	MedS	FiS	vFiS	(% of Whole Sample Passing last Sieve Hydrometer Method			Sand	Gravel
seive #	2"	1"	3/4"	1/2"	3/8"	4	10	40	100	200	0.060	0.050	0.002	Total	Total
diameter, mm	50.8	25.4	19.05	12.70	9.53	4.75	2.00	0.425	0.150	0.075					
Retained	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%	34.8%	40.5%	10.1%	2.7%	0.2%	0.2%	0.3%	88.4%	11.1%
Passing	100%	100%	100%	100.0%	100.0%	88.9%	54.2%	13.6%	3.5%	0.8%					

Graph Values		
	D_{90}	5.3
	D_{60}	1.8
	D_{30}	0.85
	D_{10}	0.34

Coefficient of Uniformity: 5.3
Coefficient of Gradation: 1.18

% of Sample < 2mm	Sand	Silt	Clay
	30%	30%	40%

USDA TEXTURAL CLASSIFICATION of FRACTION PASSING 2mm SEIVE: CLAY

OM (LOI 360) 1.8 %
CEC 21.9 meq/100g

Reviewed by: BCT Date: 10/4/2021

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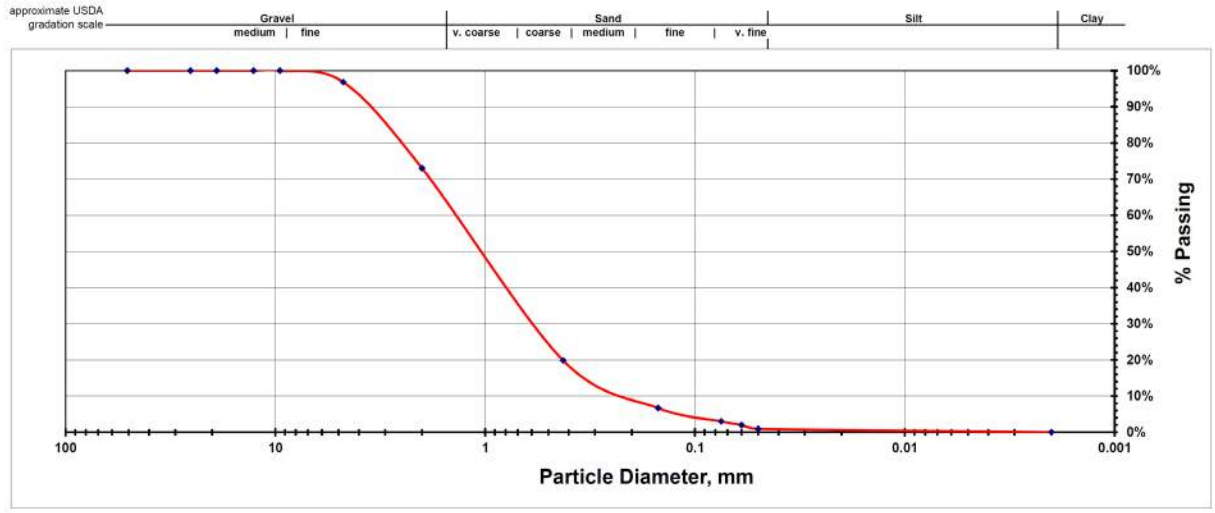
PARTICLE SIZE DISTRIBUTION REPORT

CLIENT: Quality Geo NW
PROJECT: HICKS RV QG21-104
Lab # S21-20948

Date Received 9/17/2021
Date Reported 10/4/2021
Test Method: ASTM D2487/ D 422

SAMPLE ID: TP-1 at 7'



description	CoCr	CoGr	MedGr	MedGr	MedGr	FiGr	vCoS	MedS	FiS	vFiS	(% of Whole Sample Passing last Sieve)			Sand	Gravel
seive #	2"	1"	3/4"	1/2"	3/8"	4	10	40	100	200	Hydrometer Method			Total	Total
diameter, mm	50.8	25.4	19.05	12.70	9.53	4.75	2.00	0.425	0.150	0.075	0.060	0.050	0.002		
Retained	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	23.8%	53.2%	13.2%	3.7%	1.0%	1.0%	1.0%	94.8%	3.2%
Passing	100%	100%	100%	100.0%	100.0%	96.8%	73.0%	19.8%	6.7%	3.0%					

Graph Values		
	D_{60}	3.3
	D_{50}	1.5
	D_{30}	4.00
	D_{10}	0.13

Coefficient of Uniformity: 11.5
Coefficient of Gradation: 82.05

% of Sample < 2mm	Sand	Silt	Clay
	34%	34%	32%

USDA TEXTURAL CLASSIFICATION of FRACTION PASSING 2mm SEIVE: CLAY LOAM

OM (LOI 360) 3.0 %
CEC 19.1 meq/100g

Reviewed by: BCT Date: 10/4/2021

CULTURAL RESOURCES REPORT COVER SHEET

Author: Bethany K. Mathews

Title of Report: Cultural Resource Assessment for the Exhibitor Road RV Park, Chehalis, Lewis County, WA

Date of Report: 2 December 2021

County(ies): Lewis Section: 17 Township: 14 N Range: 2W

Quad: Centralia, WA Acres: 2.3

PDF of report submitted (REQUIRED) ☒ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☒ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes ☒ No

TCP(s) found? ☐ Yes ☒ No

Replace a draft? ☐ Yes ☒ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ☒ No

Were Human Remains Found? ☐ Yes DAHP Case # ☒ No

DAHP Archaeological Site #:

_____
_____
_____
_____
_____
_____
_____
_____

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Cultural Resource Assessment for the Exhibitor Road RV Park, Chehalis, Lewis County, WA

Prepared by:
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DAHP Project #:
2021-12-08267

Lead Agency:
City of Chehalis
AC-21-022

Date of Report:
2 December 2021

CONTAINS CONFIDENTIAL INFORMATION – NOT FOR PUBLIC DISTRIBUTION

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FIGURES

EXECUTIVE SUMMARY

Antiquity Consulting was contracted by Fuller Designs to conduct a cultural resource assessment for the Exhibitor Road RV Park, located near the intersection of S Gold St and Exhibitor Rd, in Chehalis, Lewis County, WA (Township 14N Range 2W Section 17; parcel 005605080007). During the Chehalis Community Development Department Development Review Committee review for the project (AC-21-022), the City of Chehalis requested an archaeological survey be completed for the project due to the high probability for encountering archaeological resources at this location. Antiquity Consulting completed a cultural resources survey for the proposed project area in October 2021. No cultural resources were observed in the study area. Compliance with a standard Inadvertent Discovery Plan is recommended for the project.

INTRODUCTION

Antiquity Consulting was contracted by Fuller Designs to conduct a cultural resource assessment for the Exhibitor Road RV Park, located near the intersection of S Gold St and Exhibitor Rd, in Chehalis, Lewis County, WA (Township 14N Range 2W Section 17; parcel 005605080007). During the Chehalis Community Development Department Development Review Committee review for the project (AC-21-022), the City of Chehalis requested an archaeological survey be completed for the project due to the high probability for encountering archaeological resources at this location.

Project Background

During the Chehalis Community Development review for this project, the City of Chehalis requested a cultural resources survey for the project. The project is located in an area considered high probability for encountering archaeological resources. Per the Washington State Standards for Cultural Resources Reporting (Washington State Department of Archaeology and Historic Preservation 2020A), this cultural resource assessment was led by Secretary of the Interior-qualified Archaeologist Bethany Mathews, MA, RPA.

Project Description

Kevin and Melody Hicks intend to develop the Exhibitor Road RV Park, located near the intersection of S Gold St and Exhibitor Rd, in Chehalis, Lewis County, WA (Township 14N Range 2W Section 17; parcel 005605080007). The project includes the development of 43 RV parking stalls with a covered area, restroom, and access road. A propane and air filling station will be onsite as well. Water and sewer will be provided to each site. The project area encompasses 2.3 acres (Figures 1-2).

Tribal Coordination

The Confederated Tribes of the Chehalis Reservation, the Cowlitz Indian Tribe, the Nisqually Indian Tribe and Squaxin Island Tribe cultural resources staff were notified of the archaeological survey schedule on 18 October 2021. At that time Antiquity Consulting notified the Tribes that a standard pedestrian and subsurface survey would be conducted and requested to incorporate information from the respective departments into the historic context and research design.

Regulatory Context

This survey was completed at the request of the City of Chehalis, in advance of Tribal, State, or Federal consultation. The Washington State Growth Management Act requires fast-growing local governments to adopt regulations to manage development in areas with critical areas (RCW 36.70A.030). Critical areas include: (a) wetlands; (b) areas with a critical recharging effect on aquifers used for potable water; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas; and (e) geologically hazardous areas. The Growth Management Act (RCW 36.70A.20) identifies historic preservation as a planning goal, to identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance. The Lewis County Planning Policies, prepared in compliance with the Growth Management Act, identified Historic Preservation among the County's policies to guide local communities through the planning process. This policy seeks to identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance to Lewis County.

Washington State protects its archaeology and heritage resources under various laws. In Washington State it is illegal to knowingly disturb archaeological sites or certain archaeological materials on state and private lands.

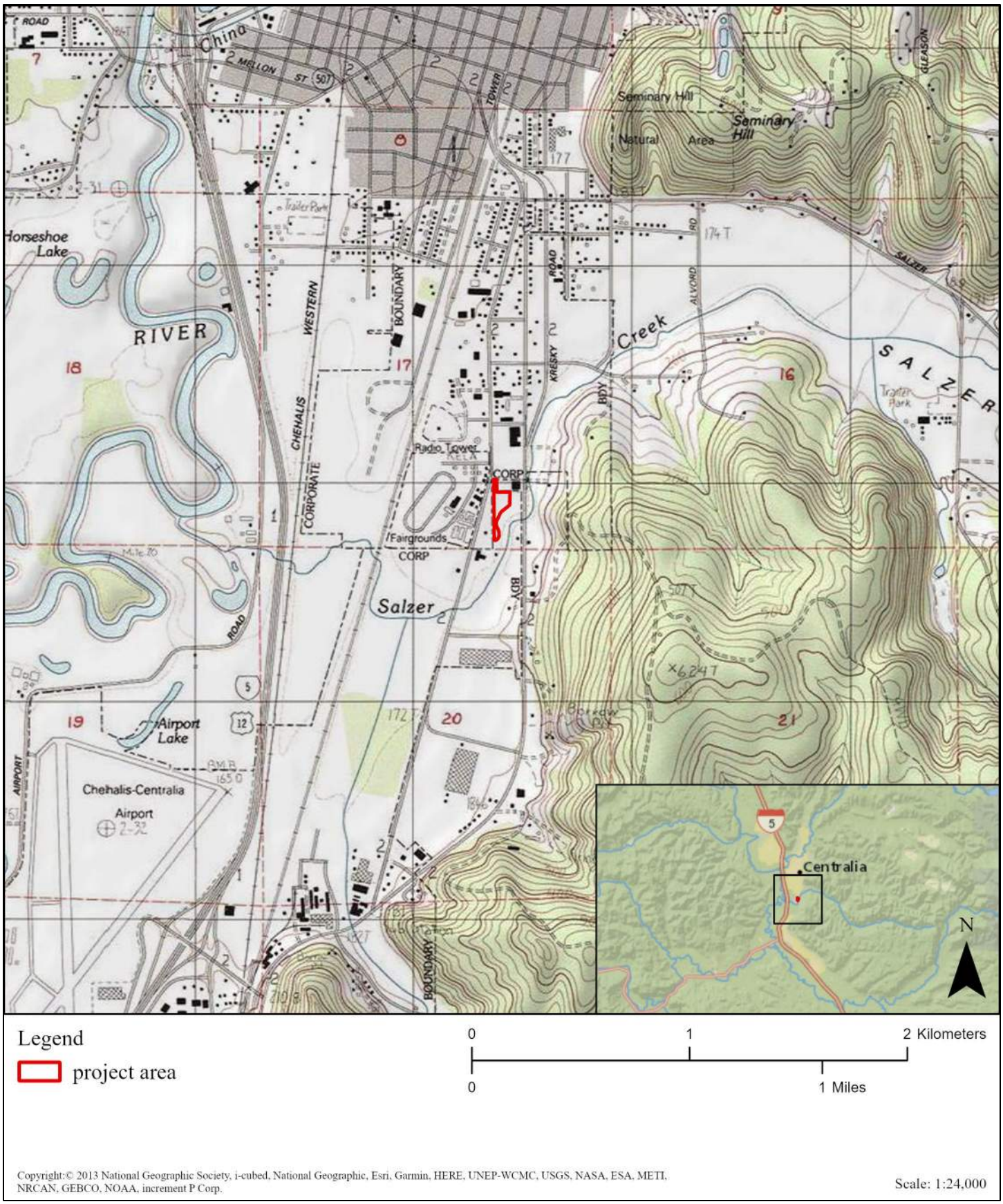

Figure 1. Project location marked on 1:24,000 Centralia, WA USGS 7.5-minute quadrangle.

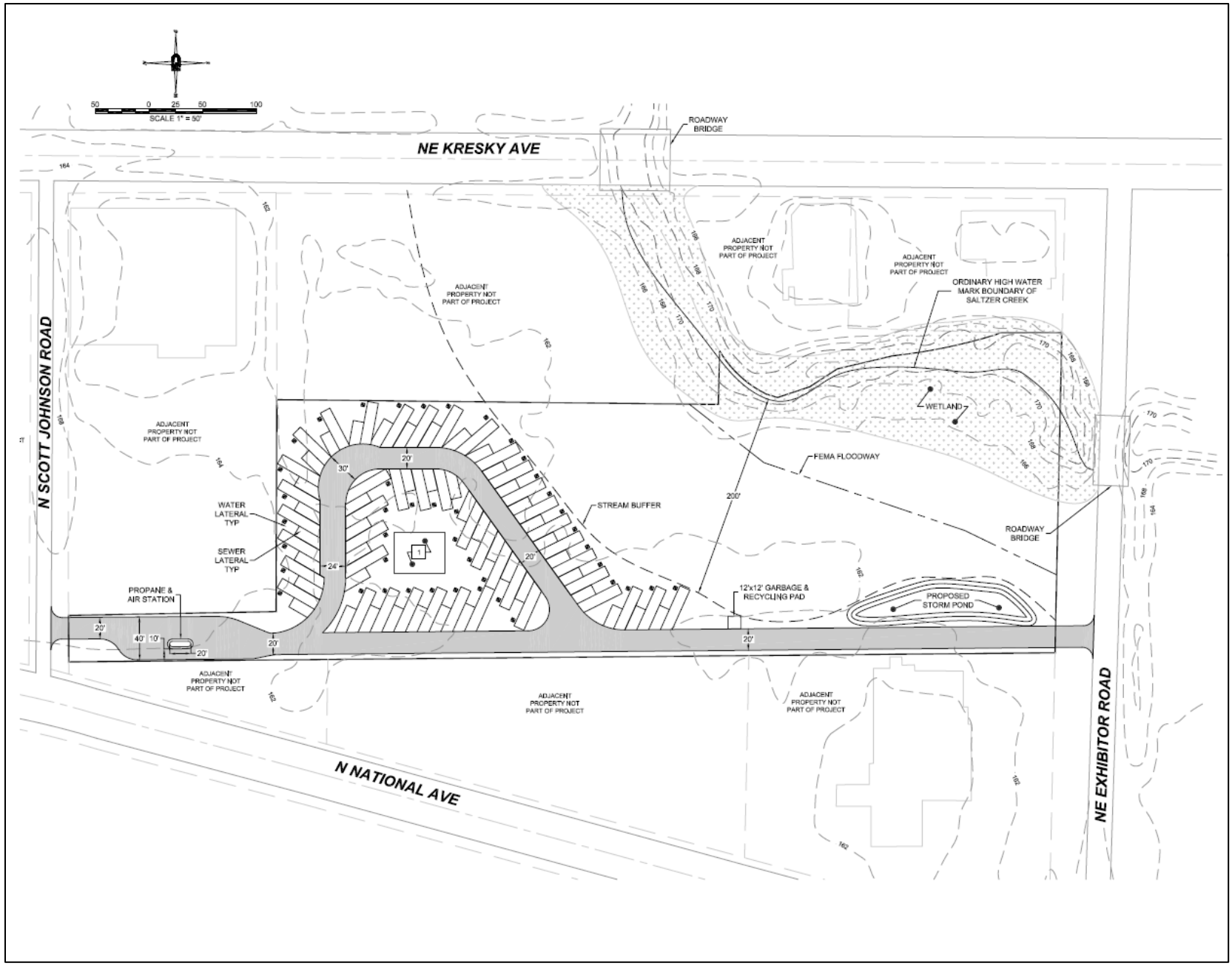

Figure 2. Project site plan, courtesy Fuller Designs.

Laws protecting these resources include the Archaeological Sites and Resources Law (RCW 27.53), Indian Graves and Records Law (RCW 27.44), Human Remains Law (RCW 68.50), and Abandoned and Historic Cemeteries and Historic Graves Law (RCW 68.60). Per RCW 27.53.060 and WAC 25-48-060 the Department of Archaeology and Historic Preservation may issue an archaeological site alteration/excavation permit for impacts to an archaeological site in accordance with a professional scientific research plan.

Evaluation of Historic Properties for the City of Chehalis Register

The City of Chehalis Historic Register is a list of buildings, sites, or districts identified by the City of Chehalis Historic Commission as having "significant character, interest, or value as part of the development, heritage, or cultural characteristics of the city, state, or nation." To be listed on the City of Chehalis Historic Register a property must be 50 years old or of exceptional importance (Chehalis Municipal Code 2.66.110).

Evaluation of Historic Properties for the Washington Heritage Register

The Washington Heritage Register (WHR), which is maintained by the DAHP, is a list of historically significant districts, sites, buildings, structures, and objects that are considered significant in local or state history (Washington State Department of Archaeology and Historic Preservation 2018). To qualify for listing on the WHR a building, site, structure, or object must be at least 50 years old, or should have documented exceptional significance if less than 50 years old. The resource should have documented historical significance at the local, state, or federal level, and should maintain a high to medium level of integrity of important character defining features.

Evaluation of Historic Properties for the National Register of Historic Places

Evaluation of historic properties at local levels is typically modeled after evaluation of historic properties for the National Register of Historic Places. A historic property is defined as "a district, site, building, structure or object significant in American history, architecture, engineering, archeology or culture at the national, state, or local level." These properties are typically evaluated in terms of historic significance, integrity, and the general stipulation that the property be 50 years old or older (for exceptions see 36 CFR 60.4, Criteria Considerations [a–g]). National Register Bulletin Guidelines state that to be eligible for listing in the NRHP, a historic property must represent a significant part of American history, architecture, archaeology, engineering, or culture (Little and Hardesty 2000; Shrimpton 1990). Additionally, to be considered eligible, a historic property must meet one or more of the four NRHP criteria:

A) be associated with events that have made a significant contribution to the broad patterns of our history; or

B) be associated with the lives of persons significant in our past; or

C) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D) have yielded, or may be likely to yield, information important in prehistory or history.

Most archaeological sites are evaluated under Criterion D, their potential to yield important information. This objective is accomplished by developing historic contexts. A historic context is a body of information about the past and the tangible expressions of past events organized by the elements of theme, place, and time (NPS

1991). The historic context for the project area is summarized in this report and serves as a foundation for evaluating cultural resources in the project area.

Historic Property Integrity

Integrity is the ability of a historic property to convey its significance. Integrity must be evident through historic qualities, which may include location, design, setting, materials, workmanship, feeling, and association (NPS 1991:1). Degree of integrity should be taken into consideration when evaluating resources under the NRHP criteria, for example:

• If eligible for its historic associations under Criterion A, then the resource should retain substantial aspects of its overall integrity, although design and workmanship may not weigh as heavily as those aspects related directly to its historic associations (NPS 1991:44-48).

• To be eligible for its association with a prominent person under Criterion B, the resource should retain some aspects of integrity, although design and workmanship may not be as important as the others (NPS 1991:44–48).

• To be eligible for its architectural merits under Criterion C, a resource must retain its physical features that constitute a significant construction technique or architectural style. Critical aspects of integrity for such properties are design, workmanship, and materials. Location and setting will also be important for those resources whose design reflects their immediate environment (NPS 1991:44–48).

• Resources significant under Criterion D may not have the type of integrity described under the other criteria but are considered to have integrity if these aspects support data potential (NPS 2020:35). Of the seven aspects of integrity, location, design, materials, and workmanship are generally the most important for Criterion D properties (NPS 1991:44–48).

ENVIRONMENTAL SETTING

The natural and cultural characteristics of a place inform the likelihood for encountering cultural resources at a geographic location. Natural and cultural characteristics of the project area were the foundation for establishing a research methodology for this cultural resource assessment. This assessment included a review of environmental information on the project area, as illustrated in reports on regional geology, local soils data, and the environmental history of the project vicinity. Post-depositional processes likely to affect any cultural deposits in the study area were also considered.

Geomorphology

The project is located near Salzer Creek, in the floodplain of the Chehalis River, on a Holocene alluvium deposit, in the Puget Lowland.

Glacial Geomorphology

Puget Lowland landforms were largely shaped by Pleistocene glacial events (Kruckeberg 1991). Beginning two million years ago, the bedrock in this province was depressed and deeply scoured by glaciers, and sediments were deposited and often reworked as glaciers advanced and retreated at least seven times. A mantle of glacial drift and outwash deposits were left across much of the region by the end of this glacial period (Easterbrook 2003). The last glacial advance and retreat to cover the region, the Vashon Stade of the Fraser Glaciation began around 19,000 BP with an advance of the Cordilleran Ice Sheet into the lowlands (Porter and Swanson 1998). The Puget Lobe of this ice sheet advanced from the Cascade Mountains down into the Puget Lowland and reached the Olympia area about 17,350 BP (unknown author 2018). The Puget Lobe began to retreat shortly after reaching its terminus near Tenino and had retreated to Olympia by 16,650 BP (Porter and Swanson 1998). Glacial lakes formed around the margins of the Puget Lobe due to the high topography of the southern Puget Sound and the ice dam of the Puget Lobe which could not yet permit drainage of the glacial meltwater and local runoff to the Pacific Ocean (Figge 2008). Outflow from glacial-lake outbursts and subglacial fluvial erosion typically flowed south toward the Chehalis River valley, and later northward-flowing streams filled the deep glacial outburst troughs with sandy sediments (Walsh et al. 2003A).

Local Geologic Units and Soils

The United States Geological Survey identifies the project parcel as being within geologic unit Qa, which is a Holocene alluvium deposit consisting of unconsolidated or semi-consolidated alluvial clay, silt, sand, gravel, and/or cobble deposits deposited primarily in stream beds and estuaries (Figure 3; Washington State Department of Natural Resources 2021A). Unit Qa is a Holocene alluvial sedimentary deposit which covers much of the lower Chehalis River Valley. Soils in the southern portion of the Puget Lowland typically form from glacial parent materials. The project area consists of Reed silty clay loam and xerorthents spoils, according to the NRCS (NRCS 2021; Table 1, Figure 4). Reed silty clay loam forms on terraces and flood plains. The typical soil profile of this unit is detailed in Table 1. The spoils unit (247) was paved with an impervious surface and testing here was avoided.

Water

The study area is situated in an area that is rich in freshwater resources. Salzer Creek is located 40 meters east of Salzer Creek, and the confluence of Salzer Creek and the Chehalis River is 1.4 kilometers west of the project.

Table 1. Soil description of the project area.

Note: derived from Natural Resource Conservation Service 2021.

Map Unit ID	Soil Series	Horizon	Description	Depth (cm)	(in)	Acidity
172	Reed silty clay loam	Ap	Very dark grayish brown silty clay loam	0-15	0-6	Medium acid
		A3	Very dark grayish brown silty clay loam	15-36	6-14	Medium acid
		B21tg	Brown silty clay	36-51	14-20	Very strongly acid
		B22tg	Very dark gray clay	51-64	20-25	Very strongly acid
		B23tg	Dark gray clay	64-79	25-31	Very strongly acid
		B24tg	Dark grayish brown silt clay loam	79-94	31-37	Strongly acid
		B25tg	Black clay	94-152	37-60	Very strongly acid

Vegetation and Fauna

The project area is located within the Western hemlock (*Tsuga heterophylla*) vegetation zone (Franklin and Dyrness 1988). The Puget Lowland forest populated the region shortly after retreat of the glaciers in the late Pleistocene. Prior to historic-era clearing, western Washington forest overstories were dominated by western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Douglas fir (*Pseudotsuga menziesii*). Glacial outwash plains support prairie habitat. Under natural conditions Reed soils support cottonwood (Populus trichocarpa), red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*), with an understory of marsh grasses, forbes, and shrubs (NRCS 2021). Vertebrate animals common in the Puget Lowland forests include deer, elk, mice, rabbits, squirrels, numerous bird species, black bear, raccoon, beaver, opossum, coyote, bats, cougar, bobcats, weasels, mole shrews (Kruckeberg 1991).

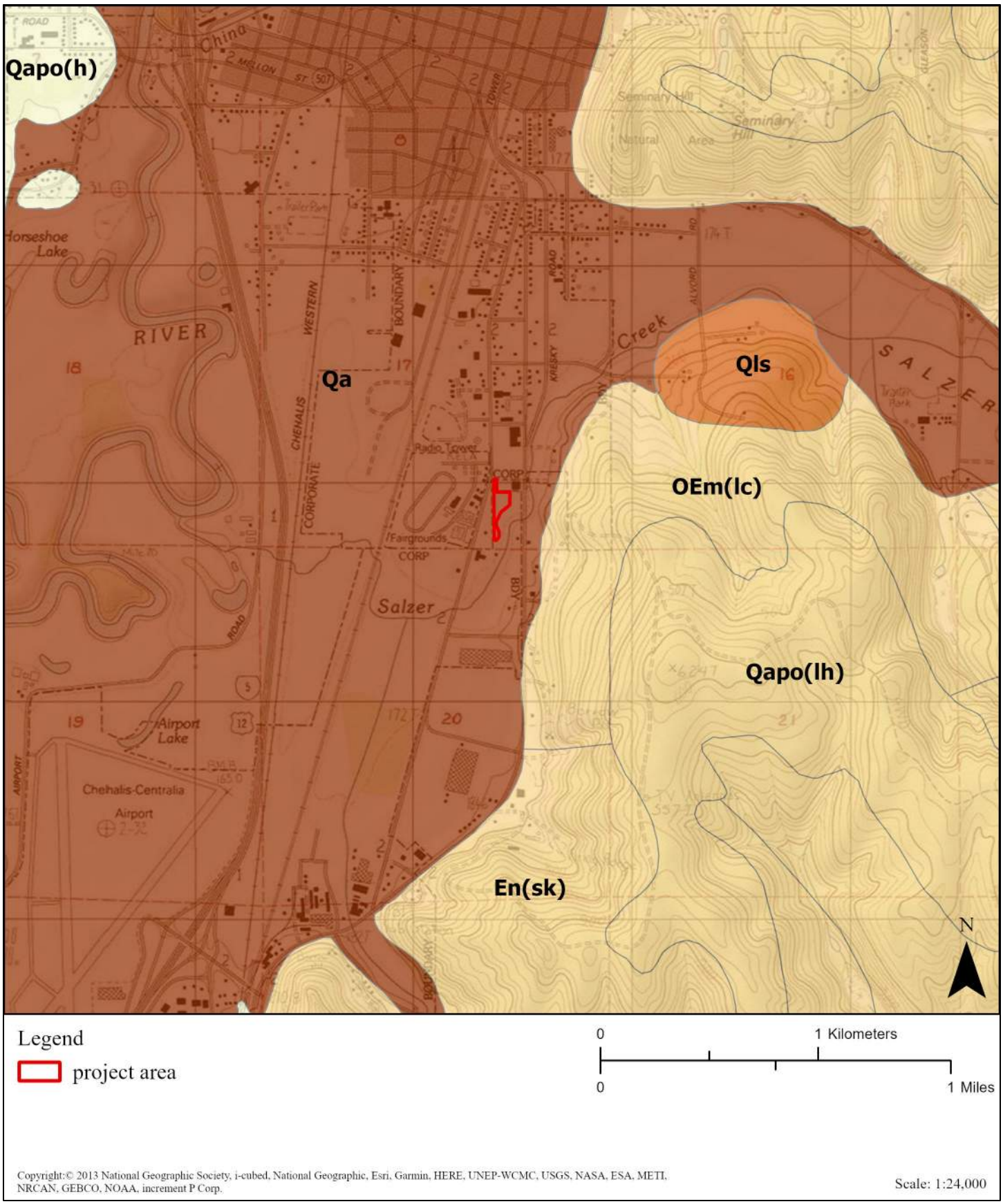

Figure 3. Surface geology of project vicinity (data from WSDNR 2021A).

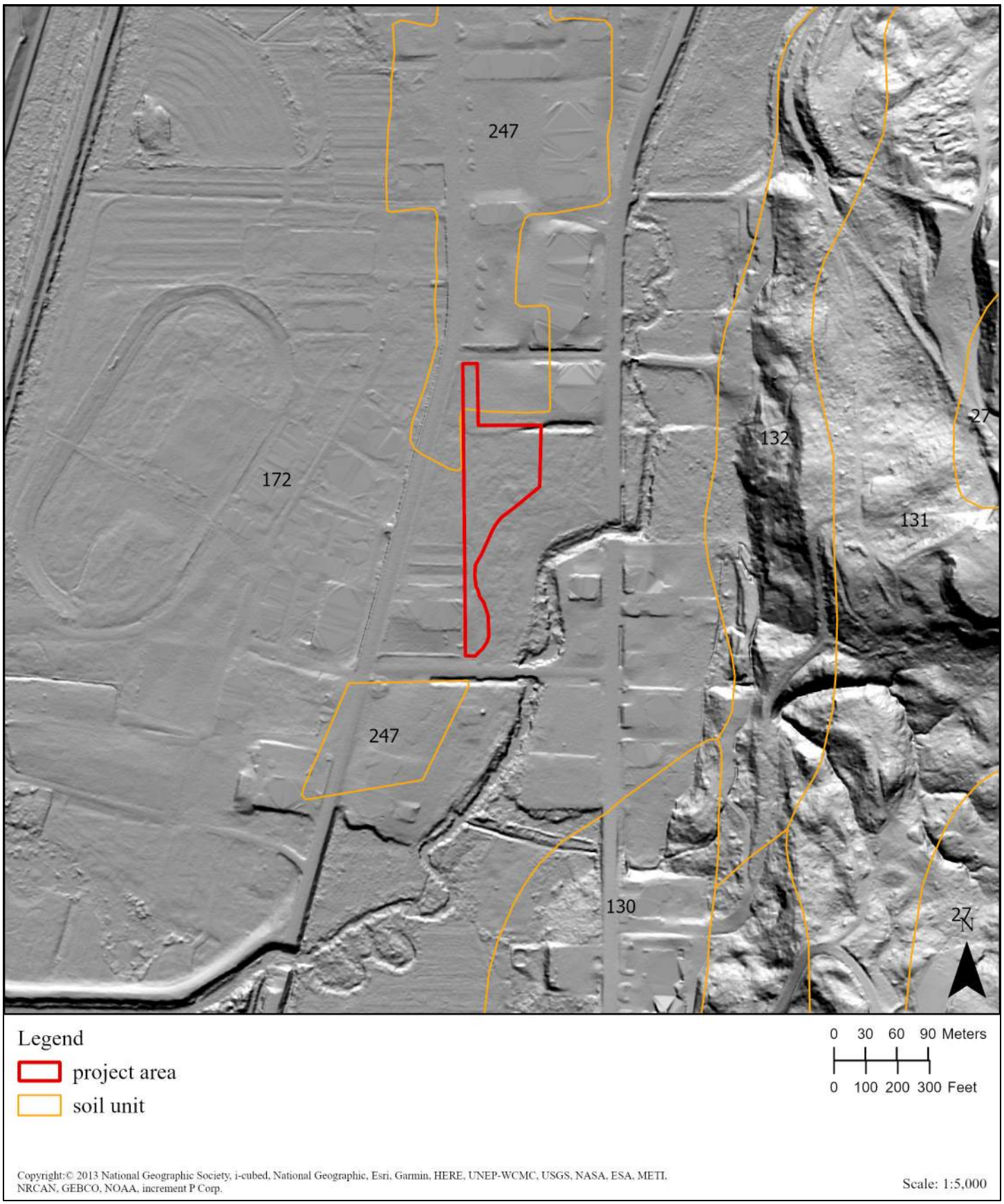

Figure 4. Soil units mapped in project area on LiDAR imagery (data from WSDNR 2021B and NRCS 2021).

CULTURAL SETTING

The project vicinity has hosted a variety of significant historic events of local, regional, and national importance. The probability for historic properties to be located within the project area is primarily based on a review of local environmental and cultural contexts, as well as local cultural resource studies and known cultural, historic, or archaeological sites. Research conducted for this assessment included review of local histories and ethnographies, and resources available in the DAHP's Washington Information System for Architectural and Archaeological Records Data database, United States Surveyor General Bureau of Land Management's General Land Office Survey Records database, HistoryLink.org, HistoricMapWorks.com, and USGS Historical Topographical Map Explorer.

Precontact and Ethnohistoric Periods

The project is located in the traditional territory of the Confederated Tribes of the Chehalis Reservation (Carpenter 2002; Marr et al. 1989:1; Spier 1936:26-32; Suttles and Lane 1990:485-487). The Chehalis fished the Chehalis, Black, Cowlitz, Satsop, Wynoochee, Elk, Johns, Skookumchuck, and Newakum Rivers (Confederated Tribes of the Chehalis Reservation 2021). In the ethnographic period, *Kwaiailk* (Upper Chehalis) inhabited the Chehalis River watershed from Cloquallam Creek to the upper reaches of the Chehalis River (Hajda 1990:504; Marr et al. 1989:1; Miller 2017; Ruby et al. 2010:157; Spier 1936:26–32; Suttles and Lane 1990:486). The name Chehalis, derived from the word for sand, originally referred to a village near Westport which was later applied to the river.

Kwaialk Villages

Like many of the Salish territories, Southwestern Coast Salish territories tended to center on major salmon-bearing streams (Hajda 1990:505). Precontact settlements were often located along major waterways, particularly at the confluence of two streams or at heads of bays or inlets, where abundant resources of coastal, riverine and inland environments supported a relatively rich, diverse, and reliable subsistence base. Waterways served as primary travel corridors between villages located on the coast or rivers, and overland trails to inland resource locations and villages were also important travel routes.

Villages in the southwestern Coast Salish region typically housed a group of 25 to 300 people, usually consisting of a man and his wife/wives, their unmarried children and adult sons, and their adult son's families (Hadja 1990:511). Marriage was exogamous, and children usually retained a strong connection to their mother's home village. Winter dwellings at village sites were typically gable-roofed houses large enough to house at least two to four nuclear families, while temporary summer dwellings were typically constructed of cedar bark slabs or pole frames covered with mats or boughs (Hadja 1990:509). When heads of households died, the house may be rebuilt nearby, or the household might disband and establish several new houses.

Although no village sites are located in the immediate vicinity of the project area, the concentration of ethnographic-period village sites along the Chehalis River suggests the project vicinity was well-traveled by Kwaialk. The following village descriptions are based on information in Marr et al. 1989, Miller 2017:100,111; Palmer and Stevenson 1992; and Upton 1971:

<u>Tè `wt`n / Skookumchuck River</u>

Tè `wt`n "fording place" was located a mile above the mouth of the Skookumchuck River, at the location now known as Waunch Prairie, north of Centralia.

‘aqàygtwas / Grand Mound

The Grand Mound area is rich with important *Kwaiailk* sites. Grand Mound is known as a place where part of a star came to earth, and the mima mounds to the west were once porpoises (Miller 2017:100). The settlement at Grand Mound called *`aqàygtwas* (“long prairie”) was a relatively large settlement. The Baker/Rochester Prairie was called *Ich-tals*.

Mouth of Lincoln Creek

A village was located at the mouth of Lincoln Creek. Lincoln Creek was an important place for camas and elk.

Mouth of Scatter Creek

The section of Scatter Creek between Rochester and Tenino was called *Q!waxtn* while the Nisqually called the creek *Wu-thlald*. In winter, Scatter Creek had an abundance of Coho salmon, while Prairie Creek had an abundance of Sockeye salmon.

s`àcəl’t & Black River

The village *s`àcəl’t* “made lake” was located at the mouth of the Black River. A village below the foothills of the Black Hills on the Black River, at the location that would become known as Gate, was a place for burial, ceremony, and potlatching at the time of American colonization. West of Rochester an overland trail, which required portage of canoes, was used during travel to Mud Bay, where *Kwaiailk* would go for shellfishing and fishing.

Mouth of Cedar Creek

A village and fish trap were located near Cedarville on the Chehalis River.

Porter Creek

A village was located at the mouth of Porter Creek below Porter.

`nsxàkʷm / Mox Chehalis

The village *`nsxàkʷm* “carrot place” was located near Malone.

Kwaiailk Resources

Traditional use of the region is generally oriented toward resource locations (i.e., fresh water, terrestrial and marine food resources, forests, and suitable terrain). Before American colonization, settlements were often located along major waterways and at heads of bays or inlets, where abundant resources of coastal, riverine and inland environments supported a relatively rich, diverse, and reliable subsistence base. During the winter months people lived in large villages of cedar large plank houses. Spring and summer months were spent at seasonal encampments while fishing, hunting, and plant/berry collecting. *Kwaiailk* differed from neighboring Nisqually in that they utilized the marine and inland landscapes (Hajda 1990:505). *Kwaiailk* territory was primarily inland, and as such plant resources were more important here than they were for other Coast Salish peoples (Hajda 1990:507). Prairies were critically important to local economies because they offered diverse resources (Smith et al. 2008:17). *Kwaiailk* burned prairies every 2 to 3 years to manage plant resources and animal forage (Storm 2004:4). The richness and diversity created by this maintenance of the landscape made these prairies critical places for hunting and gathering in the region (Storm 2004:2). Women from several villages would congregate at camas grounds when they were ready for harvesting (Marr 1989: 5). Camas bulbs were carried home after gathering, typically in the late spring and cooked in an outdoor fire pit or boiled. Many

other types of roots were collected on prairies as well.

Dwellings

Three forms of permanent dwellings were used in the Coast Salish region in the ethnohistoric period (Waterman and Greiner 1921). Quinault, Chehalis, Chinook, Clatsop, and Wishram houses were typically "gabled" and measured up to 25 by 75 feet, with a single ridgepole in the center, vertically planked walls, vertically or horizontally planked roofs, and an oval or circular door facing the water. A 3- to 6-foot-deep pit was featured at the center of the dwelling. The most common form throughout the Puget Sound, and including the Makah, Chimakum, and Quileute, was the "shed" style, which measured 40- to 90-feet wide by 500- to 1500-foot long. These dwellings usually paralleled the beach, with entrances facing the water and roofs slanting toward the back of the dwelling. The "shed" style homes featured a 1-foot deep trench extending the length of the building, and some featured one or more central pits. "Gambrel" style houses were also constructed in the Puget Sound area, featuring lean-tos on one or all sides of a "shed" style dwelling. Large ceremonial or festival houses might be temporarily dismantled seasonally, and boards were used at temporary shelters. Summer dwellings were temporary and constructed of cedar bark slabs or pole frames covered with mats or boughs (Hadja 1999:509).

Archaeological Context

Thousands of years of human occupation in this region area have been summarized in a number of archaeological, ethnographic, and historical investigations over the past 60 years, providing a regional context for evaluating cultural resources in the project area (e.g. Blukis 1987; Greengo 1983; Hajda 1990; Matson and Coupland 1995; Nelson 1990; Suttles and Lane 1990). Archaeological context for evaluating resources in the project vicinity is provided by the local and regional chronological sequence and research problem domains included in Ames and Maschner (1999), Carlson (1990), Larson and Lewarch (1995), Wessen and Stilson (1987), and others.

Historic Period

The landscape of western Washington has been radically transformed over the last 150 years, transitioning from old-growth forest to timberland and farmland, to its current use for residential, recreational, agricultural, and industrial purposes. This shift of land use is typical of western US settlement patterns. The history outlined in this report focuses on regional events as they pertain to cultural resources in the project vicinity.

History of Land Ownership in Washington State, 1800s to 1900s

The first non-native immigrants to the area were European, Hawaiian, and Metis employees of the Hudson's Bay Company (HBC) who arrived in the early 1800s with the development of HBC trading posts and agricultural stations. The Puget Sound Agricultural Company (PSAC), an agricultural subsidiary of the HBC was established in 1838 (Crooks 2007). PSAC operations focused at two locations: one at Cowlitz Farm (Toledo, WA) and the other at Fort Nisqually (DuPont, WA). By the mid-nineteenth century, the PSAC holdings included 150,000 acres between the Puyallup and Nisqually Rivers, much of which was worked from outstations and satellite farms.

The project vicinity was jointly occupied by the United Kingdom and the United States until the Oregon Treaty of 1846. The presence of the HBC, a British company, began to decline at this time, being replaced by American settlement and industry. Few American settlers lived in what would become Oregon Territory by the 1840s. To encourage American settlement in Oregon Territory the US passed the Donation Land Claim Act of

1850, which amended previous land claim laws and required that land surveys and claims conform to government standards. The Donation Land Claim Act granted 320 acres of land to white male citizens over 18 (Riddle 2010). A married man could claim 640 acres. Recipients only needed to prove, within 4 years, that they lived on and cultivated the land. If a claimant arrived between 1850 and 1855, they could claim 160 acres if single and 320 acres if married. In 1854, an extension of the act also allowed for purchase of the claims at $1.25 an acre instead of proof of cultivation and residence. About 25% of western Washington lands were claimed through the Donation Land Claim Act (Mathews 2019).

In 1862, the United States government passed the Homestead Act, which granted 160 acres to heads of households (Muhn and Hanson 1998:20). Homestead applicants were issued a patent on their land if they either proved residence and cultivation after five years, requiring the investment and labor of building a residence, clearing land, and planting crops; or they could purchase the land via a "cash entry" after only 6 months. Only about 40% of claims were "proved up" and 20% of lands in Washington State were claimed through this act (Mathews 2019). In Lewis County, 2% (n=44) of Homestead Act patents were granted to women, which is much lower than in other parts of the West but average for western Washington (Mathews 2021).

The United States also granted lands directly to railroad companies to encourage the development of transcontinental rail lines in the 1860s (Muhn and Hanson 1988:21). In 1862, rail companies were granted five alternate odd-numbered sections for each mile of planned rail railroad, within 10 miles of the planned railroad. In 1864, this was increased to twenty sections for each mile of railroad. Railroad land grants were considered controversial, as they limited the potential for settlement of the area, and the policy of granting to railroads ended in 1871.

The United States passed several land grant acts and amendments to the Homestead Act through the early 1900s, to encourage settlement and industry in the west. The Timber Culture Act of 1873 granted 160 acres to individuals who planted 40 acres with trees, with trees spaced no more than 12 feet apart (6,750 trees), for a period of 10 years (Muhn and Hanson 1988:22). In 1877, the Desert Land Law granted 640 acres to individuals who paid $0.25 an acre and irrigated dry, treeless property within 3 years. The Dawes Severalty Act of 1887 assigned 160-acre allotments to individual tribe members and opened the remainder of lands to homesteaders (Wilma 2000). The Enlarged Homestead Act of 1909 increased the maximum homestead grant acres to 320 acres for individuals who homesteaded non-irrigable lands (Bradsher 2012). The Stock Raising Act of 1916 granted up to 640 surface acres, to include lands that were deemed only useful for grazing and raising forage crops (United States Congress 1916).

Early American Settlements in Chehalis

American settlers in the region began organizing for self-governance in 1851, resulting in the establishment of Washington Territory in early 1853. Like most western Washington communities, Chehalis began as a community of land claimants in the mid- to late-1800s. A post office serving the local community was established on Saunders Prairie in 1858 (Crowell 2007:70). The community was bolstered by the construction of a railroad depot in Chehalis in 1873, businesses grew through the 1880s, and by the early 1890s the town had become a community hub (Ott 2008A). Arson fires destroyed many of the town buildings in 1892, but businesses were rebuilt north of the original town core.

Study Area Property Ownership and Land Use History, 1850s to present

In the 1850s, the United States sought to make treaties with Washington tribes and assign them to reservations in order to open land for American settlement (Richards 2005:343). American colonization and settlement of indigenous people's lands began illegally according to the United States' Nonintercourse Act (U.S.C. § 177). In February 1855 the Quinault, Queets, Satsop, Lower Chehalis, Upper Chehalis, Shoalwater Bay, Chinook, and Cowlitz met with Washington Territorial Governor Isaac Stevens at the Chehalis River Treaty Council (Lane and Lane 1999). Most of the tribal representatives were unsatisfied with the United States' proposed relocation to a poorly defined reservation on the Olympic Peninsula. In February 1855 only the Quinault representatives initially agreed to the Chehalis River Treaty terms, which were revised in the Quinault River Treaty and signed by the Quinault in July 1855. Although the Chehalis had not reached an agreement with the United States, their lands were rapidly claimed by American settlers in the 1850s to 1860s, causing the United States to establish the Confederated Tribes of the Chehalis Reservation in 1864 (Hadja 1999:514; Ott 2008B). The United States intended for other local tribes to join the Upper and Lower Chehalis on the Chehalis Reservation, but many did not, although some Cowlitz were among the people who removed to the Chehalis Reservation. Humptulips, Cowlitz, and Shoalwater Bay people refused to accept goods distributed by reservation officials, fearing it would be considered payment for unceded land (Hajda 1990:515; Ruby et al. 2010:130). Many Cowlitz maintained an independent organization, and in the 1870s there were 66 members of the Cowlitz band living at the mouth of the river while 105 "Cowlitz Klickitat" lived on the Upper Cowlitz and its tributaries (Carpenter 2002:200). Some Cowlitz relocated to the Yakima Reservation around 1900 (Hajda 1999:515).

In 1894, the Northern Pacific Railroad was granted 216,000 acres, which included the project area (Bureau of Land Management 2021A).

Historical Map Review

No improvements are recorded within the project area on the 1856 General Land Office survey plat of Township 12N Range 2W (Figure 5; Bureau of Land Management 2021B). The plat map indicates a Pilkinson residence had been established about ¼ mile northwest of the project area, however the General Land Office database does not include a record of any patents being issued to anyone named Pilkinson in Lewis County, suggesting Pilkinson did not "prove up" on a Donation Land Claim.

By 1916 the Northern Pacific Railroad line had been established along the eastern boundary of the project area (Figure 6; USGS 1916). Lidar imagery (see Figure 4) does not indicate any remnant of the railroad grade near the project vicinity. The Southwest Washington Fair was established 150 meters west of the project in 1909 (Southwest Washington Fairgrounds 2021). The roadways that are now National Avenue and Gold Street had been established by this time. The property was owned by an I.S. Floe in 1948 (Figure 7; Metsker 1948). By 1953, three structures had been constructed on the property (Figure 8; USGS 1953). These properties appear to have been cleared by 1975 and the property has apparently remained vacant to this day (Figures 9-10; USGS 1975, 1985).

Figure 5. Portion of 1860 Township 14N Range 2W GLO Map, with project location indicated (Source: Bureau of Land Management 2021A).

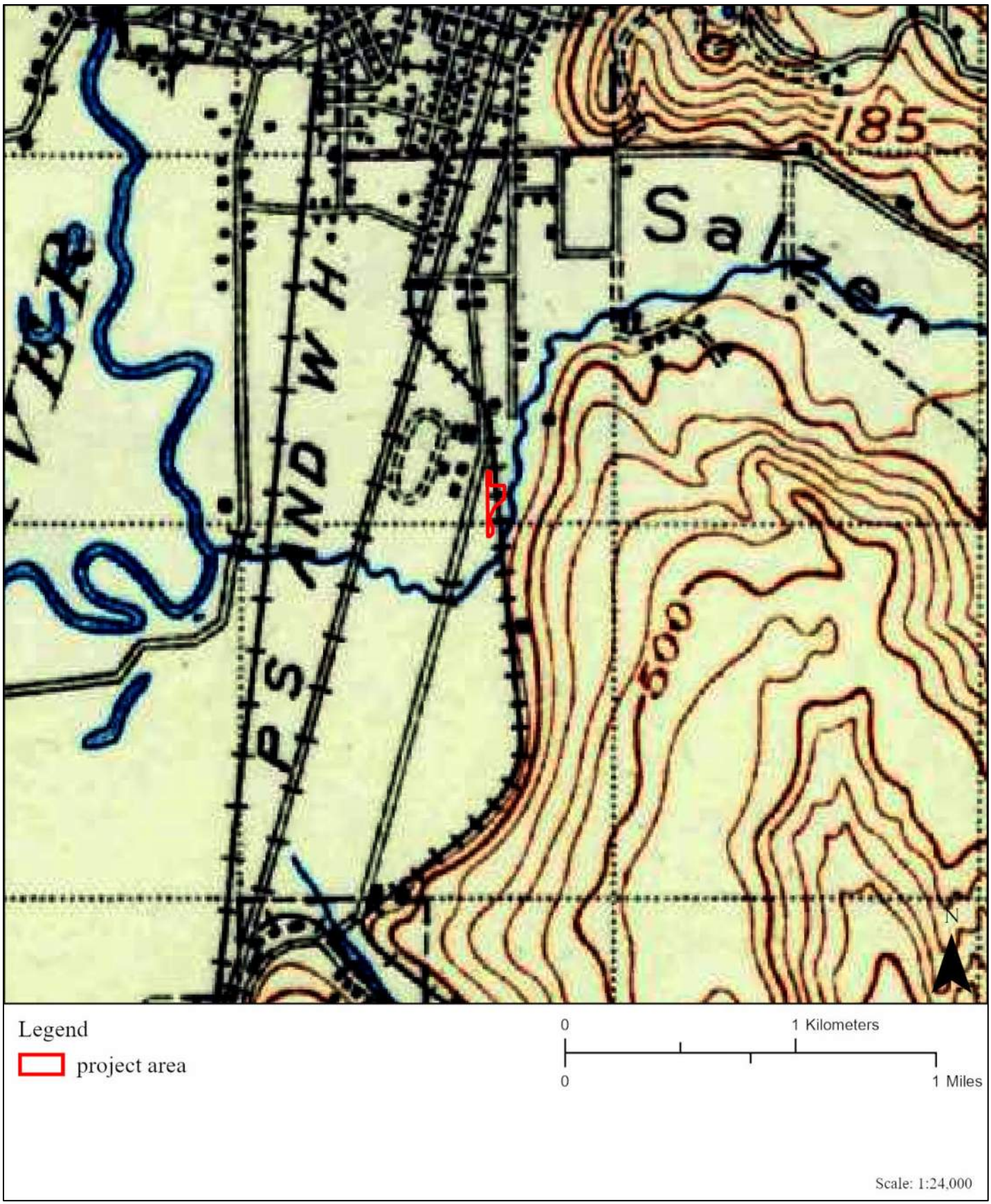

Figure 6. Portion of 1916 1:125,000 Chehalis topographic map, with project location indicated (Source: USGS 1916).

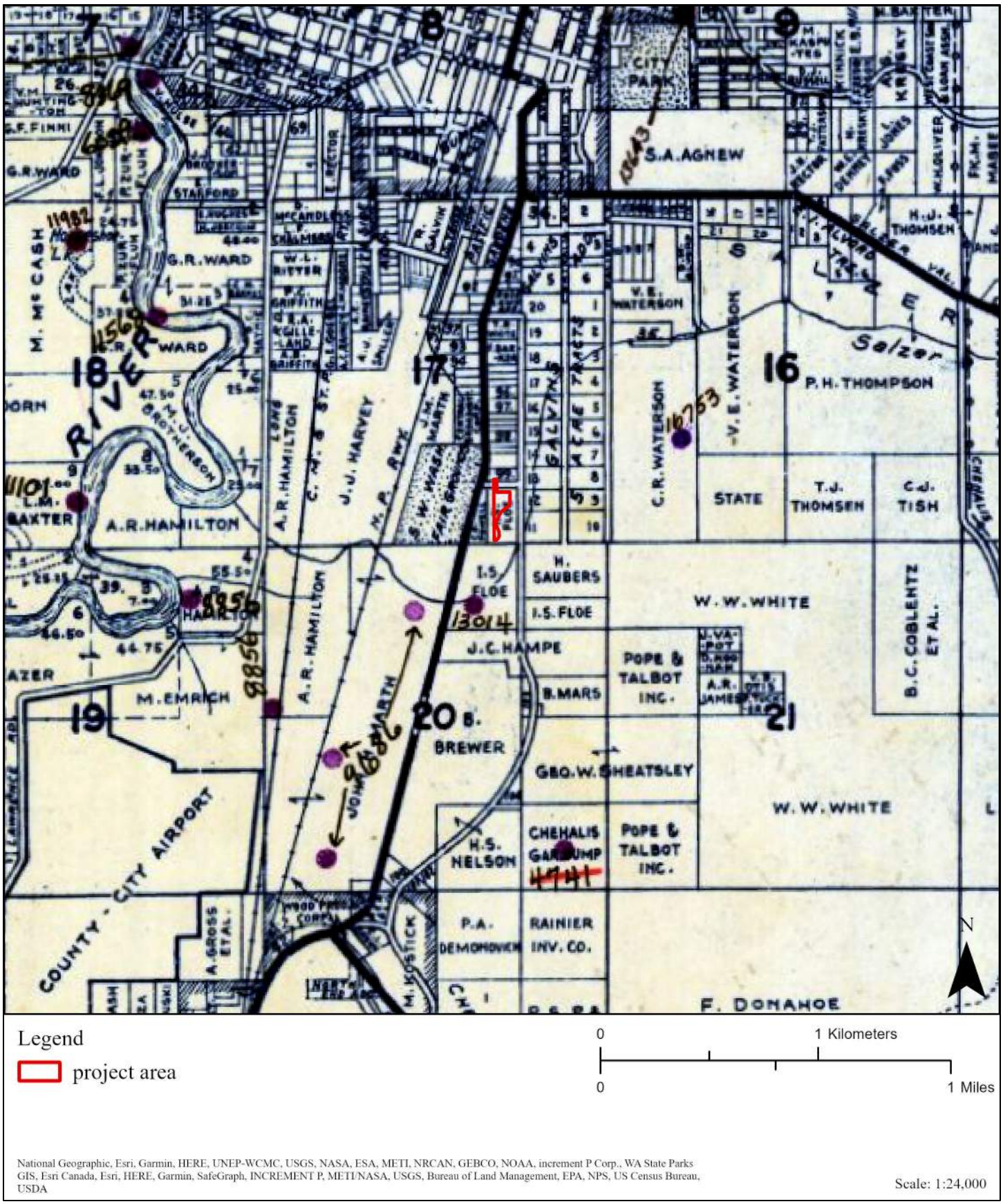

Figure 7. Portion of 1948 Metsker map of project vicinity (Source: Metsker 1948).

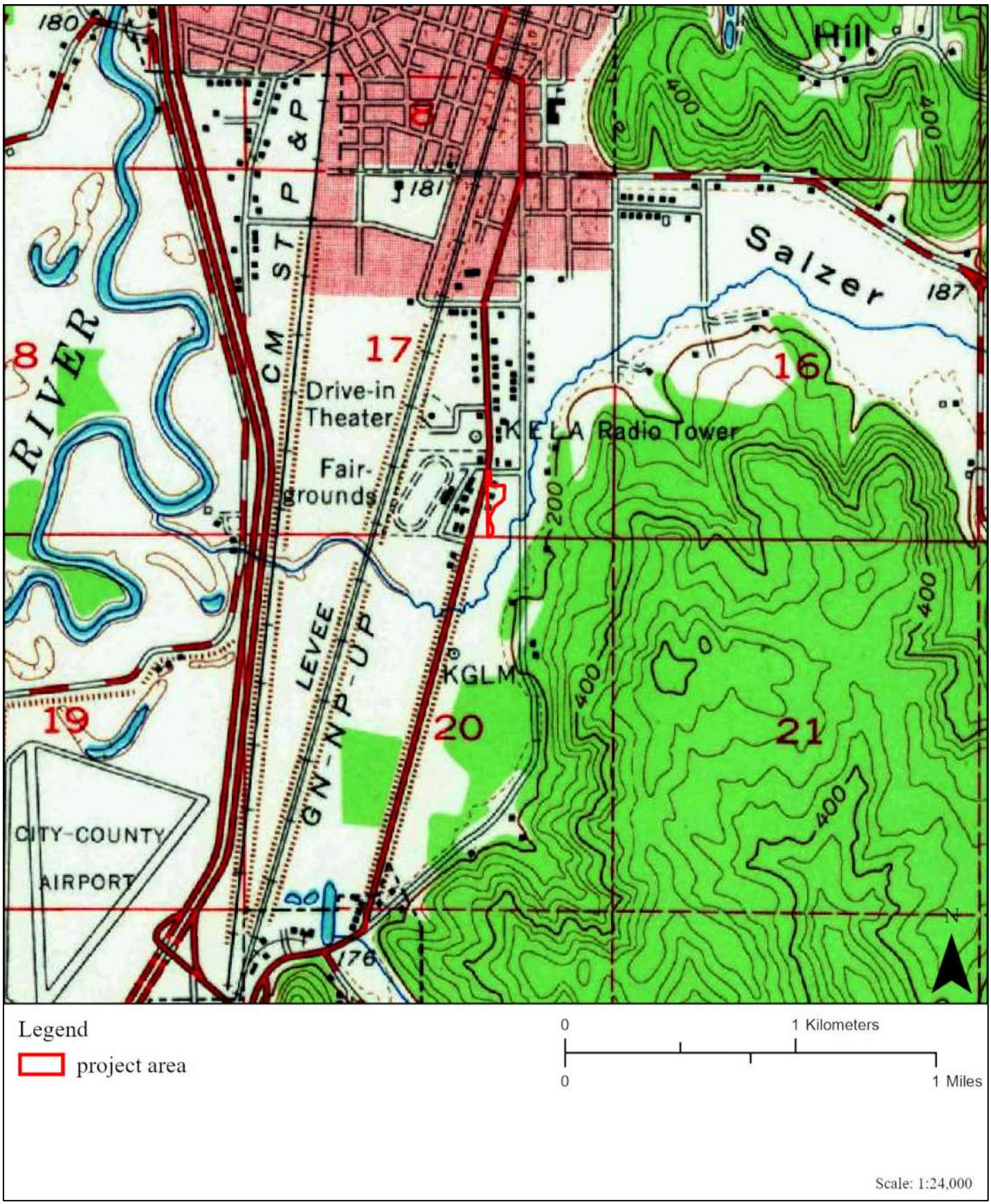

Figure 8. Portion of 1953 1:62,500 Centralia topographic map, with project location indicated (Source: USGS 1953).

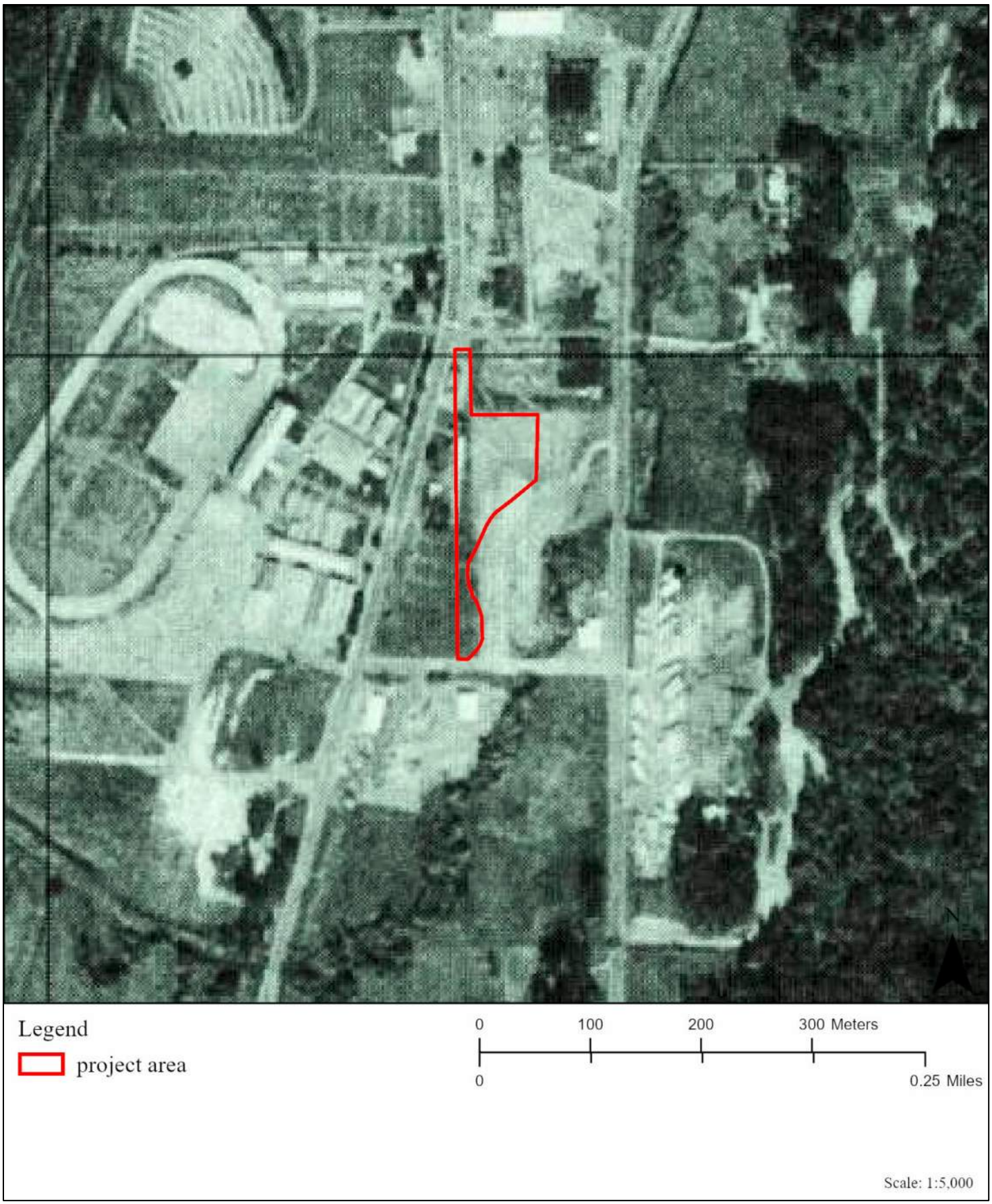

Figure 9. Portion of 1975 aerial image, with project location indicated (Source: USGS 1975).

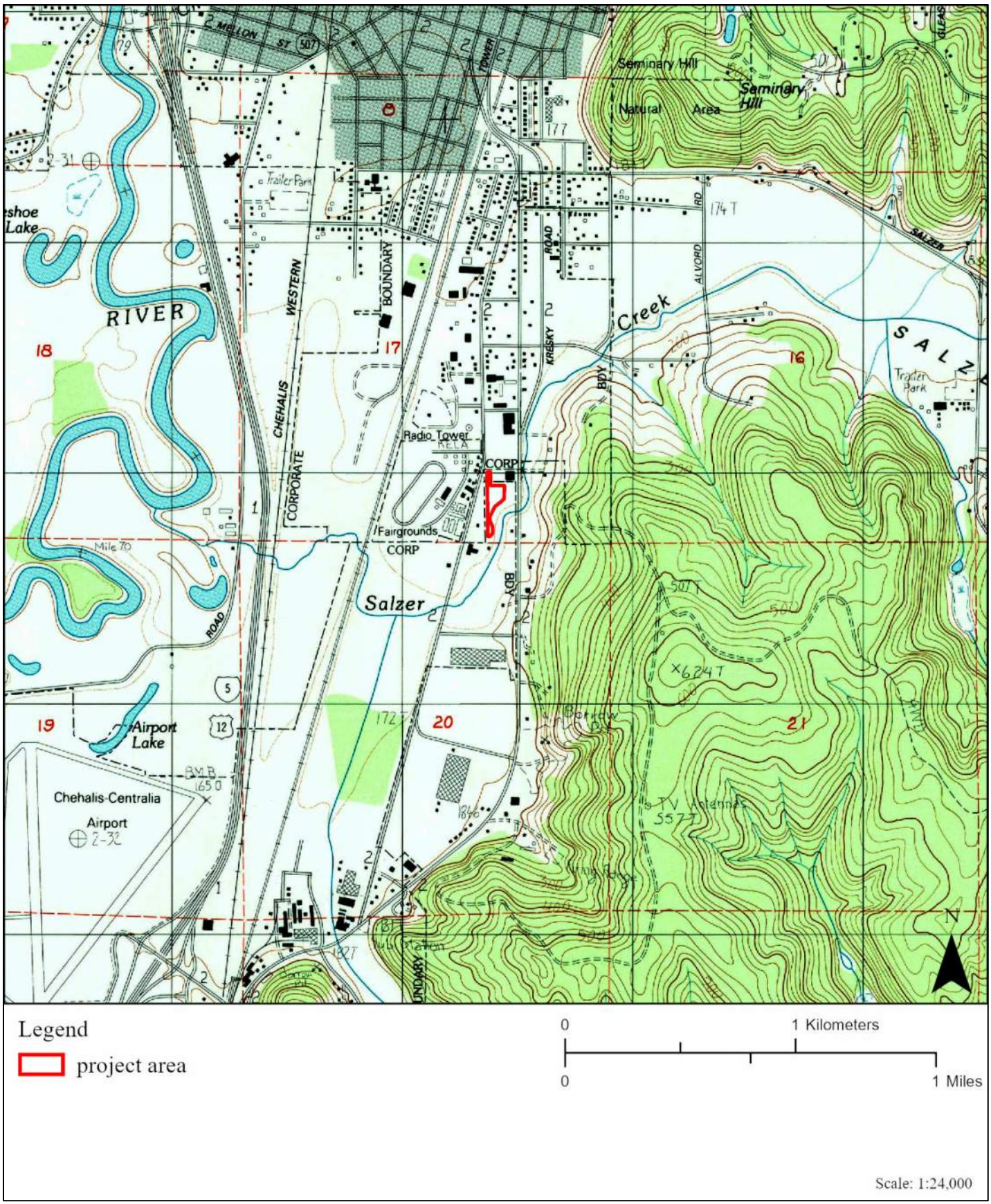

Figure 10. Portion of 1985 1:24,000 Centralia topographic map, with project location indicated (Source: USGS 1985).

LITERATURE REVIEW

The Washington Information System for Architectural and Archaeological Records Data (WISAARD) database (Washington State Department of Archaeology and Historic Preservation 2021A) was reviewed to determine whether any archaeological sites or other historic properties had previously been recorded in the project vicinity (a study radius of one mile). The DAHP archaeological resources predictive model available in WISAARD indicates the project area has a very high risk for containing archaeological resources based on environmental factors, with survey highly advised.

Cultural Resource Surveys

The project area has not been surveyed since at least 1996 (the earliest survey date available in WISAARD). A total of 31 cultural resource assessments have been completed within 2 kilometers of the project area, primarily near the Chehalis River. Many of the surveys completed in the vicinity of the project were completed for flood management projects within the Chehalis River floodplain.

Historic Properties

A total of 825 historic-age properties are located within 2 kilometers of the project area, according to the property inventory database available in WISAARD. No register-eligible properties have been listed within 2 kilometers of the project area.

Archaeological Sites

A total of 34 archaeological sites have been recorded within 2 kilometers of the project area. Many precontact lithic sites are concentrated along the Chehalis River. Within the vicinity of the project, sites appear to cluster near the confluence of the Chehalis River and Salzer Creek, however this apparent concentration is in part due to the research history of developed areas in Centralia and Chehalis. A few small precontact sites (45LE511, 45LE824, 45LE182, and 45LE784) are concentrated on Salzer Creek. Closest to the project area, sites 45LE766, 45LE765, 45LE768, and 45LE767 are concentrated around the Southwest Washington Fairgrounds, about 300 meters west of the project. These sites are small concentrations or isolates of lithic artifacts. On Salzer Creek, 310 meters southwest of the project area, site 45LE784 consists of a small concentration of lithic debitage, a biface, and thermally altered rock.

Cemeteries

No cemeteries have been recorded within two kilometers of the project area.

RESEARCH DESIGN

Information on the local environment and cultural setting were considered prior to fieldwork in order to determine the likelihood for identifying cultural resources in the project area. The DAHP archaeological predictive model indicates there is a moderate risk for encountering precontact archaeological resources in the project area, and study of the local environment and history indicate the probability for encountering precontact- and historic-period archaeological resources is moderate. Thorough pedestrian survey and sub-surface testing were planned to assess the potential impacts to cultural resources in the planned project area.

Expectations

The potential for precontact archaeological sites associated with *Kwaiailk* history should be considered very high for the project area, due to the presence of local resources and archaeological sites. Although no distinct sites were identified at this location during a review of ethnographic and archaeological information, the project is located in an area that is known to have been well-traveled and well-used. The Chehalis River and its tributaries are known to have been economically and culturally important places for indigenous people of this region, and mapped environmental features indicate the project area may have offered resources suitable for sustenance, tool-making, shelter, and other cultural needs.

The potential for encountering significant historic-age cultural resources in the project area should be considered moderate. Historic-period use of the property was likely residential. The potential for site preservation due to both environmental and cultural factors should be considered moderate for the project area, due to the apparent history of previous development at this site and some limited surficial disturbance.

Field Methodology Plan

The archaeological survey was designed to identify archaeological resources in the project area and assess whether proposed project plans might impact cultural resources. Pedestrian survey was planned across the entire project area. Given the high probability for encountering a significant archaeological site within the project area, shovel probes were planned at 30-meter (100 feet) intervals across the project area, in areas that were observed to be relatively undisturbed by previous roadway construction. If archaeological materials were encountered during subsurface testing, additional shovel probes were to be excavated at 5-meter intervals in each cardinal direction, within the project area. Areas of steep slope or massive disturbance were to be deemed low probability for containing significant archaeological resources.

Shovel probes (SPs) were planned to extend approximately 100 centimeters below surface (cmbs; 3.3 feet), to an undisturbed Pleistocene glacial sediment, or until excavation was deemed unproductive, in order to assess the possible presence and depth of cultural deposits. Hand tools were to include shovels, digging bars, bucket augers, trowels, and pruners. Excavated materials were to be screened through 1/4” hardware mesh and returned to the SP. All cultural materials were to be returned SPs upon completion and recordation of the SP data, placed beneath the sod. SP locations, photographs, and data were to be recorded via ArcGIS Survey123 on a Samsung Pro Active tablet with a horizontal accuracy of approximately 5 meters.

SURVEY RESULTS

Field Methodology

Archaeological fieldwork was conducted on 22 October 2021 by Principal Investigator Beth Mathews, MA, RPA, and Field Technicians Brinn Smith and Nikola Troup, under clear conditions. Pedestrian and shovel probe survey was completed at approximately 30-meter intervals along the project area. Probes were sometimes placed slightly outside direct impact areas in order to avoid mechanical disturbance, filling, and impervious surfaces (Figure 11). Shovel probes measured approximately 40 cm in diameter and were excavated stratigraphically in 20 cm arbitrary levels. Probes were terminated in the C-horizon if compaction prevented further excavation. All excavated sediments were passed through ¼-inch mesh hardware cloth using a standard shaker-style screen. The findings of each probe including location, photographs, soil data and any observed cultural materials were recorded via ArcGIS Survey123 on a Samsung Pro Active tablet with a horizontal accuracy of approximately 5 meters.

Survey Findings

The project area is situated within the floodplain of the Chehalis River, near Salzer Creek. The project area has previously been cleared of vegetation, but surface visibility was limited by grasses (Figures 12-13). A total of 10 shovel probes were excavated to an average depth of 73 cm. Shovel probe descriptions are attached to this report in Appendix A. Shovel probes encountered compacted and disturbed sediments along the western boundary of the project area. Brick fragments were observed in Shovel Probe 1 in the upper 27 centimeters. Shovel probe 2 encountered compacted fill which prevented excavation below 50 centimeters. One piece of melted glass was observed at 30 centimeters in shovel probe 6.

Analysis

The project area was considered moderate risk for encountering archaeological resources due to the local historic context and the DAHP predictive model. Thorough subsurface testing with few constraints did not result in the identification of precontact or historic archaeological materials. Historically, the location of Salzer Creek appears to have been stable, based on historic maps and aerial imagery. Interbedding of yellow sands at the base of many of the shovel probes suggests Holocene alluvium may be limited to the upper 1 meter of the project area. The results of this survey indicate that the project area has been moderately impacted by a circa 1940s residence development and later demolition.

CONCLUSIONS AND RECOMMENDATIONS

Background review suggested the proposed development project is located in an area of very high risk for encountering archaeological resources. The project area was thoroughly surveyed to assess potential project impacts to cultural resources, and no archaeological materials or historic properties were observed within the project area. No further cultural resources work is recommended for this project. Compliance with a standard Inadvertent Discovery Plan is recommended.

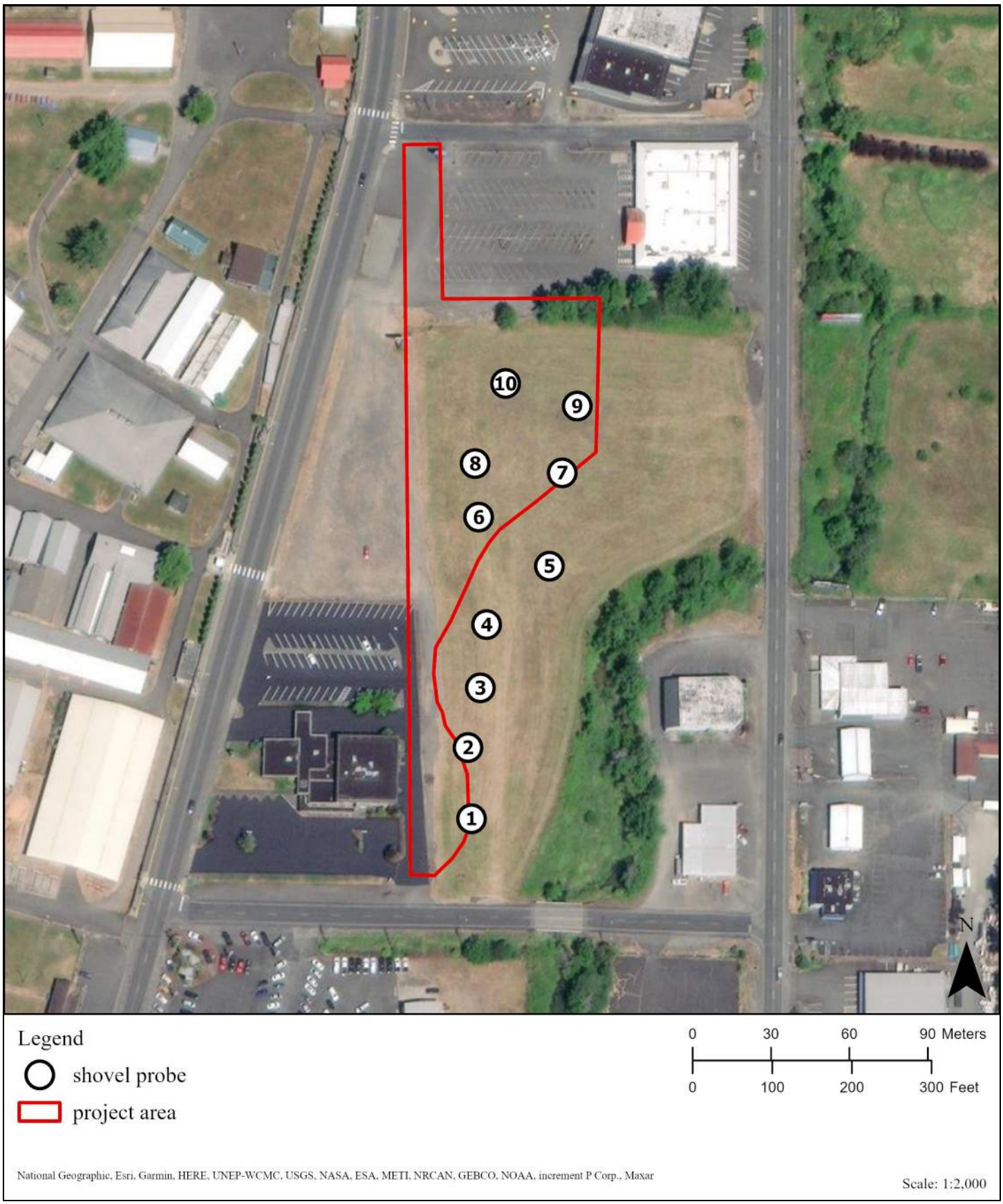

Figure 11. Shovel probe locations illustrated on aerial image.

Figure 12. Project overview, view northwest on Exhibitor Road.

Figure 13. Project overview, view southwest from northeast corner of project area with Salzer Creek at left midground.

INADVERTENT DISCOVERY PROTOCOL

Archaeological Materials Inadvertent Discovery Protocol

A cultural resource is an object, site, building, or structure that may be eligible for local, state, or national registers. A cultural resource discovery could be prehistoric or historic and is typically more than 50 years old. When in doubt, assume the material is a cultural resource. If any employee, contractor or subcontractor believes that they have uncovered a cultural resource at any point in the project, all work must stop immediately in compliance with RCW 27.53. Leave the surrounding area untouched and provide a demarcation adequate to provide the total security, protection, and integrity of the discovery. Notify on-site project management and personnel of the work stoppage to ensure security of the discovery. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work in the immediate area will not resume until treatment of the discovery has been completed.

Contacts

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Human Skeletal Remains Inadvertent Discovery Protocol

In accordance with RCWs 68.50.645, 27.44.055, and 68.60.055, if ground disturbing activities encounter human skeletal remains during the course of construction, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance until the State provides notice to proceed. The finding of human skeletal remains will be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic.

If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains."

Contacts

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APPENDIX A: SHOVEL PROBE LOG

Shovel Probe #1

Date & Time October 22, 2021 10:50 AM **Probe Diameter** 30cm **Reason for Termination** Manual tool limits	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** Modern materials 0-27cmbs Brick fragments in upper 27cm. <1% Small organics throghout, including bark and grass.	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-6 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 5-15%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Very angular, Angular	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** B: SUBSOIL (zone of accumulation)		6-68 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 5-15%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Very angular, Angular, Sub-angular, Sub-rounded	**Gravel Size** Pebbles
		Lower Boundary Distinctness Abrupt <2cm	**Lower Boundary Topography** Smooth
Stratum III	**Soil Horizon** Alluvium		68-80 **cmbs**
Color Gray	**Sediment Compaction**	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting**	**Gravel Angularity** Sub-rounded	**Gravel Size**
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes Depth of Holocene deposit unknown.			

Shovel Probe #2

Date & Time October 22, 2021 10:20 AM **Probe Diameter** 40cm **Reason for Termination** Gravel content/size	**Archaeologist** Beth Mathews **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-5 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 5-15%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Angular	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Abrupt <2cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** CONSTRUCTION FILL		5-50 **cmbs**
Color Dark yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 15-25%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Very angular, Angular	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography** Irregular
Notes			
Terminated for compaction and gravel			

Shovel Probe #3

Date & Time October 22, 2021 12:37 PM **Probe Diameter** 40cm **Reason for Termination** Compaction. Large silt stone or silt concretion in wall.	**Archaeologist** Beth Mathews, Nikola Troup **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-7 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Angular, Sub-angular	**Gravel Size** Pebbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** CONSTRUCTION FILL		7-53 **cmbs**
Color Yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular	**Gravel Size** Pebbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			

Shovel Probe #4

Date & Time October 22, 2021 12:47 PM **Probe Diameter** **Reason for Termination** C-horizon	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** Choice_1		0-8 **cmbs**
Color	**Sediment Compaction**	**Sediment Texture**	
Gravel %	**Gravel Sorting**	**Gravel Angularity**	**Gravel Size**
		Lower Boundary Distinctness	**Lower Boundary Topography**
Stratum II	**Soil Horizon** CONSTRUCTION FILL		8-45 **cmbs**
Color Yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Angular, Sub-angular, Sub-rounded	**Gravel Size** Pebbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Smooth
Stratum III	**Soil Horizon** C: SUBSTRATUM (contains partly weathered bedrock)		45-86 **cmbs**
Color Brown	**Sediment Compaction** slightly loose	**Sediment Texture** Clay sand	
Gravel % 0%	**Gravel Sorting**	**Gravel Angularity**	**Gravel Size**
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			
Augered from 50cm			

Shovel Probe #5

Date & Time October 22, 2021 1:41 PM **Probe Diameter** 30cm **Reason for Termination** C-horizon	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist**	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-4 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 1-4%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** B: SUBSOIL (zone of accumulation)		4-72 **cmbs**
Color Yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles
		Lower Boundary Distinctness Abrupt <2cm	**Lower Boundary Topography** Wavy
Stratum III	**Soil Horizon** C: SUBSTRATUM (contains partly weathered bedrock)		72-76 **cmbs**
Color Yellow	**Sediment Compaction** very compact	**Sediment Texture** Sand	
Gravel % 0%	**Gravel Sorting**	**Gravel Angularity**	**Gravel Size**
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			

Shovel Probe #6

Date & Time October 22, 2021 1:57 PM **Probe Diameter** 40cm **Reason for Termination** 80 cm with no change	**Archaeologist** Nikola Troup **Tribal Archaeologist**	**Cultural Materials Present?** Modern, 30cmbs 1 piece of melted glass, 2cm wide	
Stratum I	**Soil Horizon** O: HUMUS (typical layers: duff, partially decomposed, and well decomposed)		0-10 **cmbs**
Color Dark brown	**Sediment Compaction** very loose	**Sediment Texture** Silty clay	
Gravel % 0%	**Gravel Sorting**	**Gravel Angularity**	**Gravel Size**
		Lower Boundary Distinctness Abrupt <2cm	**Lower Boundary Topography** Smooth
Stratum II	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		12-80 **cmbs**
Color Yellowish brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 25-40%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Angular, Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			

Shovel Probe #7			
			
Date & Time October 22, 2021 2:47 PM **Probe Diameter** 40cm **Reason for Termination** Manual tool limits	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist**	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-7 **cmbs**
Color Brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 1-4%	**Gravel Sorting**	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** B: SUBSOIL (zone of accumulation)		7-70 **cmbs**
Color Yellowish brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			
Augered from 45cm.			

Shovel Probe #8

Date & Time October 22, 2021 3:53 PM **Probe Diameter** 40cm **Reason for Termination** C-horizon	**Archaeologist** Nikola Troup **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** O: HUMUS (typical layers: duff, partially decomposed, and well decomposed)		0-12 **cmbs**
Color Brown	**Sediment Compaction** slightly loose	**Sediment Texture** Silty clay	
Gravel % 0%	**Gravel Sorting**	**Gravel Angularity**	**Gravel Size**
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		12-80 **cmbs**
Color Yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 15-25%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Angular, Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Abrupt <2cm	**Lower Boundary Topography** Smooth
Stratum III	**Soil Horizon** B: SUBSOIL (zone of accumulation)		80-110 **cmbs**
Color Pale brown	**Sediment Compaction** very loose	**Sediment Texture** Sandy clay	
Gravel % 5-15%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded, Rounded	**Gravel Size** Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			

Shovel Probe #9

Date & Time October 22, 2021 4:39 PM **Probe Diameter** 40cm **Reason for Termination** Manual tool limits	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-4 **cmbs**
Color Brown	**Sediment Compaction**	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** B: SUBSOIL (zone of accumulation)		4-77 **cmbs**
Color Yellowish brown	**Sediment Compaction** very compact	**Sediment Texture** Silty clay	
Gravel % 5-15%	**Gravel Sorting** poorly sorted	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			
Augered from 53cm. Terminated for compaction.			

Shovel Probe #10

Date & Time October 22, 2021 4:57 PM **Probe Diameter** 40cm **Reason for Termination** Manual tool limits	**Archaeologist** Beth Mathews, Brinn Smith **Tribal Archaeologist** Jeremy Badoldman Perkuhn, Nisqually	**Cultural Materials Present?** None	
Stratum I	**Soil Horizon** A: SOIL (zone of leaching with high organic content)		0-3 **cmbs**
Color Brown	**Sediment Compaction**	**Sediment Texture** Silty clay	
Gravel % 5%	**Gravel Sorting**	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness Clear 2-5cm	**Lower Boundary Topography** Wavy
Stratum II	**Soil Horizon** B: SUBSOIL (zone of accumulation)		3-52 **cmbs**
Color Yellowish brown	**Sediment Compaction** slightly compact	**Sediment Texture** Silty clay	
Gravel %	**Gravel Sorting**	**Gravel Angularity** Sub-angular, Sub-rounded	**Gravel Size** Pebbles, Cobbles
		Lower Boundary Distinctness	**Lower Boundary Topography**
Notes			

Stream Buffer Enhancement Plan
for
Hicks RV Park
&
XXXX Exhibitor Road
Chehalis, Washington

Prepared for:
Fuller Designs
1101 Kresky Ave
Centralia, WA 98531

Project # 187.15

Prepared by:
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Table of Contents

SIGNATURE PAGE

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned:

Timothy J. Haderly, Principal Scientist/Owner
Loowit Consulting Group, LLC

INTRODUCTION

Purpose and Need

Loowit Consulting Group, LLC (LCG) was retained by Fuller Designs (Applicants Representative) to complete a stream buffer enhancement plan for a proposed RV park at XXXX Exhibitor Road in northern Chehalis, Washington.

Construction of the RV Park will impact approximately 1,375 sq ft of stream buffer to allow proper design criteria for RV spaces, access roads, and turning radii required for RV parks. Mitigation for proposed impacts is regulated under City of Chehalis Municipal Code (CMC) *17.25 – Fish and Wildlife Habitat Areas.* This enhancement plan has been designed to satisfy requirements within *CMC 17.25.070 – Mitigation Standards* to achieve a no net loss of habitat functions and values.

Site Description

The subject site consists of a single parcel totaling approximately 4.20 acres of commercial property. Site specifics include:

Site Address:	XXXX Exhibitor Road Chehalis, WA
Current Owner:	Hicks, Kevin & Melody
Tax Parcel Number:	005605080007
Legal Description:	Section 17, Township 14 North, Range 2 West, W.M.
Property Size:	Approximately 4.20 acres
Jurisdiction:	City of Chehalis

The subject site is located north of Exhibitor Road, east of Gold Street, west of Kresky Avenue, and south of Scott Johnson Road in the northern portion of Chehalis, Washington (Figure 1). The subject site consists of a flat, mowed grass field with a strip of mixed shrubs and a few trees along the northern property boundary, and a mix of shrubs and trees in the riparian area along Salzer Creek (Photograph 1). Salzer Creek flows from north to south in the south east corner of the subject site (Photograph 2) and exits the site beneath a bridge on Exhibitor Road (Photograph 3). The main site access is via Exhibitor Road to the south (Photograph 4), but there is also an access from Scott Johnson Road to the north.

Enhancement Plan

Assessment of Impacts

Approximately 1,375 sq ft of stream buffer will be impacted with the construction of the RV Park.

Mitigation Approach

Impacts to stream buffers will be mitigated by enhancing the existing on-site buffer adjacent to the proposed development area. Existing conditions of the stream buffer is a mowed grass area used as an overflow vehicle parking area for the Fairgrounds and Event Center west of the subject site.

ARW Landscape Design (ARW) was retained by Fuller Designs to develop a project wide landscape plan including the stream buffer area. ARW concentrated on native plants but did include a few non-native trees to add texture and color to the area (see attached landscape drawings). In addition to plantings, a gravel surface pedestrian loop pathway is proposed within the planted buffer. An irrigation system will also be installed according to the schematic contained in the attached landscape drawings.

Table 1 summarizes proposed plantings within buffer areas.

Table 1: Stream Buffer Enhancement (2,782 ft^2)

Common Name	Scientific Name	Material	Spacing/ Size	Number of Pieces
Groundcover				
Kinnikinnick	*Arctostaphylos uva-ursi*	1-gal	4’ o.c.	257
Grass				
Northern Lights Tufted Hair Grass	*Deschampsia caespitosa*	1-gal	2’ o.c.	51
Shrubs				
Black Twinberry	*Lonicera involucrata*	2-gal	5’ o.c.	13
Snowberry	*Symphoricarpos albus*	2-gal	4’ o.c.	52
Evergreen Huckleberry	*Rubus ovatum*	2-gal	4’ o.c.	61
Pacific Ninebark	*Physocarpus capitatus*	2-gal	10’ o.c.	33
Red Currant	*Ribes sanguineum*	2-gal	4.5’ o.c.	67

Spiraea	*Spiraea douglasii*	2-gal	4.5’ o.c.	14
Shrubs				
Autumn Gold Maidenhair Tree	*Ginko biloba*	2” cal	25’ o.c.	5
Bitter Cherry	*Prunus emarginata*	2” cal	25’ o.c.	8
Douglas Fir	*Pseudotsuga menziesii*	7-8’ ht	25’ o.c.	23
Oregon Ash	*Fraxinus latifolia*	2” cal	As shown	6
Paperbark Maple	*Acer griseum*	2” cal	As shown	4
Vine Maple	*Acer circinatum*	7-8’ ht	20’ o.c.	16
			Total	646

Installation of trees and shrubs will result in a much improved stream buffer which is currently lacking tree/shrub cover.

Planting Plan

Site Enhancement Procedure

See the attached landscaping drawings for specific notes on planting procedures.

Buffer Signs

All-weather signs will be placed every 100 linear feet along the outer buffer boundary and anchored a minimum 4 feet above ground elevation on all-weather posts. Signs will be designed in conformance with design requirements of City of Chehalis.

Planting Specifications

Plantings will consist of native trees and shrubs similar to those found in the local area within the Newaukum River drainage. The selected species will encourage development of a dense tree/shrub community and will increase the variety and quality of existing habitat potential of the stream and buffer. Plants will be installed in late fall or early spring to avoid expected loss of plants from dry and hot conditions. Plants will be installed according to the planting scheme container within the attached landscape drawings. A combination of container and bare root stock will be used.

Plant Material Specifications

Specifications for plant materials are contained within the attached landscape drawings.

In addition to installing plants,

Table 3: Summary of Mitigation Measures

Disturbance	Required Measures to Minimize Impacts
Lights	• Direct lights away from streams and buffers.
Noise	• Locate activity that generates noise away from the buffer. • If warranted, enhance existing buffer with native vegetation plantings adjacent to noise source. • For activities that generate relatively continuous, potentially disruptive noise, such as certain heavy industry or mining, establish an additional 10 feet heavily vegetated buffer strip immediately adjacent to the outer stream buffer.
Toxic runoff	• Treat and contain any toxic runoff. • Route all new, untreated runoff away from stream.
Stormwater runoff	• Apply integrated pest management standards. • To improve existing water quality runoff that may be impacting buffer functions. Retrofit existing stormwater detention and treatment for roads and existing adjacent development. • Prevent channelized flow from lawns that directly enters the buffer. • Use Low Intensity Development techniques (per PSAT publication on LID techniques).
Change in water regime	• In order to maintain stream hydrology and discharge only clean stormwater toward the stream. Stormwater should be treated; then infiltrated, detained, and/or dispersed outside the stream buffer for any new runoff from impervious surfaces and new lawns. Permanent improvements to the site hydrology that would improve buffer and functions and not create off-site flooding.

Disturbance	Required Measures to Minimize Impacts
Pets and human disturbance	• Use privacy fencing at buffer edge OR plant dense vegetation to delineate buffer edge and to discourage disturbance using vegetation appropriate for the ecoregion.
Dust	• During construction or for commercial or industrial activities, use best management practices to control dust.
Disruption of corridors or connections/habitat enhancement	• In order to improve habitat quality and connectivity, a vegetation enhancement plan that improves areas with minimal trees and vegetation and proposes removal of invasive vegetation and replacing it with ground cover and shrubs that will provide dense vegetative cover at maturity. • Planting noninvasive plants that provide improved filtration of sediment, excess nutrients, and pollutants that may be present. • Maintain habitat connections to off-site areas that are undisturbed. • Restore corridors or connections to off-site habitats by replanting.

Goals, Objectives, and Performance Standards

The goal of the buffer enhancement will be to increase functions and values over current conditions by the installation of native trees and shrubs, restricting pedestrian encroachment, maintaining plants for a minimum 5 years, and placing the area under a deed restriction for long-term protection. To accomplish these goals, the following objectives and performance standards are appropriate to ensure the success of the restoration area (Table 4):

Objective 1. Enhance 2,782 sq ft of stream buffer by planting native trees/shrubs.

Performance Standard 1a: In Year 0, install plants according to specifications previously listed.
Performance Standard 1b: In Year 0, install irrigation system.
Performance Standard 1c: In Year 0, install buffer signs.

Performance Standard 2a: Two permanent monitoring stations established.
Performance Standard 2b: In Year 1, plantings meet 100% survival.
Performance Standard 2c: In Year 1, invasive species <10% (excluding reed canary grass).

Performance Standard 3a: In Year 2, plantings meet 100% survival.
Performance Standard 3b: In Year 2, invasive species <10% (excluding reed canary grass).

Performance Standard 4a: In Year 3, plantings meet 100% survival.
Performance Standard 4b: In Year 3, invasive species <10% (excluding reed canary grass).

Performance Standard 5a: In Year 5, plantings meet 100% survival.
Performance Standard 5b: In Year 5, invasive species <10% (excluding reed canary grass).

Table 4: Performance Standard Summary

Year	Performance Standard
Zero	• 1a – Install Plants • 1b – Install irrigation system • 1c – Install buffer signs
One	• 2a – Establish two monitoring stations. • 2b – Plantings meet 100% survival • 2c – Invasive species <10% (excluding reed canary grass)

Two	• 3a – Plantings meet 100% survival • 3b – Invasive species <10% (excluding reed canary grass)
Three	• 4a – Plantings meet 100% survival • 4b – Invasive species <10% (excluding reed canary grass)
Four	Off year, no monitoring, routine site maintenance
Five	• 5a – Plantings meet 90% survival • 5b – Invasive species <10% (excluding reed canary grass)

Monitoring Plan

The stream buffer enhancement area will be monitored for a 5-year period following project construction, in Years 1, 2, 3, 4 & 5. Monitoring reports will be submitted to City of Chehalis by December 31st of each monitored year. The Year 1 report shall also serve as the as-built report and contain the necessary drawing. The goal of monitoring is to determine if the previously stated performance standards are being met. The mitigation area will be monitored once a year during the growing season, between March 15 and May 15 (Table 5). Monitoring and photo stations will be established to document the plant growth over time. Individual plants will be counted and recorded each monitoring year to assess the percentage survival rate; plants will be replaced as-needed.

Table 5: Stream Buffer Maintenance, Monitoring, and Reporting Summary

Year	Task	Reporting
Zero	• Remove invasive species • Install plantings • Install mulch	• Progress letter to City
One	• Routine maintenance • Replace dead plants • Mow invasive plant species • Irrigate as needed • Monitor site between March 15 and May 15	• Year one monitoring report to City by December 31st • As-built drawing to City by December 31st
Two	• Routine maintenance • Replace dead plants • Mow invasive plant species • Irrigate as needed • Monitor site between March 15 and May 15	• Year two monitoring report to City by December 31st

Three	• Routine maintenance • Replace dead plants • Mow invasive plant species • Irrigate as needed • Monitor site between March 15 and May 15	• Year three monitoring report to City by December 31st
Four	• Routine maintenance • Replace dead plants • Mow invasive plant species • Irrigate as needed	• None
Five	• Routine maintenance • Replace dead plants • Mow invasive plant species • Irrigate as needed • Monitor site between March 15 and May 15	• Year five monitoring report to City by December 31st

Monitoring Report Contents

The annual monitoring reports will contain at least the following:

1. Location map and as-built drawing.
2. Historic description of project, including dates of plant installation, current year of monitoring, and restatement of restoration goals, objectives, and performance standards.
3. Description of monitoring methods.
4. Documentation of plant survival and overall development of the plant communities.
5. Assessment of non-native, invasive plant species and recommendations for management.
6. Observations of wildlife, including invertebrates, amphibians, reptiles, fish, birds, and mammals.
7. Photo documentation from permanent photo points.
8. Summary of maintenance and contingency measures proposed for the next season and completed for the past season.

Site Protection

The enhancement area will be owned, maintained, and managed by the property owner, unless otherwise assigned. The property owner will be responsible for maintenance and monitoring of the restoration areas for the 5-year period. Signage will be installed along the outer perimeter of the mitigation area at 100-foot intervals and will be maintained by the property owner to raise awareness and help limit disturbances.

Maintenance and Contingency Plans

Maintenance Plan

Maintenance at the mitigation areas may involve mowing, watering, and re-installing failed plants as necessary. The maintenance will include the following:

1. Irrigate planted species as necessary during the dry season, approximately July 1 through October 15.
2. Mow around the base of the plantings to lessen the competition from non-native herbaceous species, particularly reed canary grass.

If the mitigation area plantings are failing or the performance standards are not met, steps will be taken to rectify the situation in a timely manner. The following steps will be implemented when an area is identified as failing or potentially failing:

1. Identify the cause(s) of the failure or potential failure.
2. Identify the extent of the failure or potential failure.
3. Implement corrective actions by replanting.
4. Document the activities and include this data in the annual monitoring and maintenance reports.
5. Consult with the appropriate agencies in the event that a routine corrective action will not correct the problem.
6. Evaluate recommendations from resource agency staff and implement recommendations in a timely manner.

Contingency Plan

If the performance standards are not met after ten years following project completion, a contingency plan will be developed and implemented. All contingency actions will be undertaken only after consulting and gaining approval from City of Chehalis. A contingency plan will include: (1) the causes of failure, (2) proposed corrective actions, (3) a schedule for completing corrective actions, and (4) whether additional maintenance and monitoring are necessary.

LIMITATIONS

The findings and conclusions contained in this document were based on information and data available at the time this document was prepared and evaluated using standard Best Professional Judgment. LCG assumes no responsibility for the accuracy of information and data generated by others. Local, State, and Federal regulatory agencies may or may not agree with the findings and conclusions contained in this document.

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Washington Department of Fish and Wildlife Salmonscape (http://apps.wdfw.wa.gov/salmonscape/map.html).

Washington Department of Fish and Wildlife Priority Habitat and Species (http://apps.wdfw.wa.gov/phsontheweb/).

FIGURES

ARW Landscape Design

L1.1 Landscape Plan, North Area

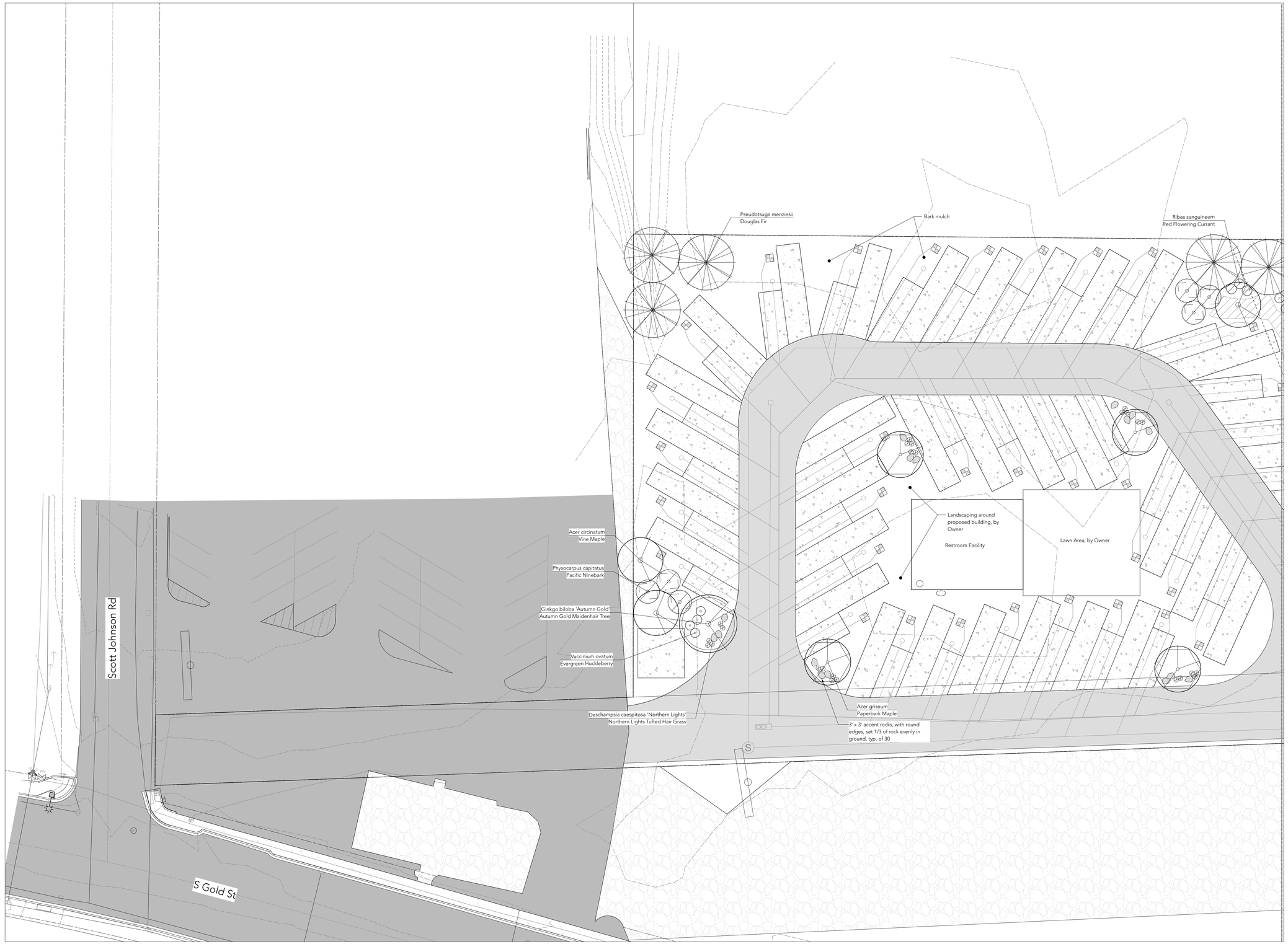
L1.2 Landscape Plan, South Area

L1.3 Plant Schedule, Materials Schedule, and Planting Details

IR1.1 Irrigation Plan, North Area

IR1.2 Irrigation Plan, South Area

IR1.3 Irrigation Details



Client Logo:

FULLER DESIGNS

Hicks RV Park

0 Exhibitor Rd.
Chehalis, Wa.
98532

Landscape Plan

Revisions	Date
xx	xx

Project #:
22-110

Date:
02/15/22

Sheet Size / Scale:
34"x22" / 1" =20'

Stamp:

STATE OF WASHINGTON
AMY RUSHO WOLFE
Amy Rusho Wolfe
REG. 1551 EXP. 04/01/2022
LICENSED LANDSCAPE ARCHITECT

Landscape Architect:
ARW Landscape Design
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Scale: 1"=20'

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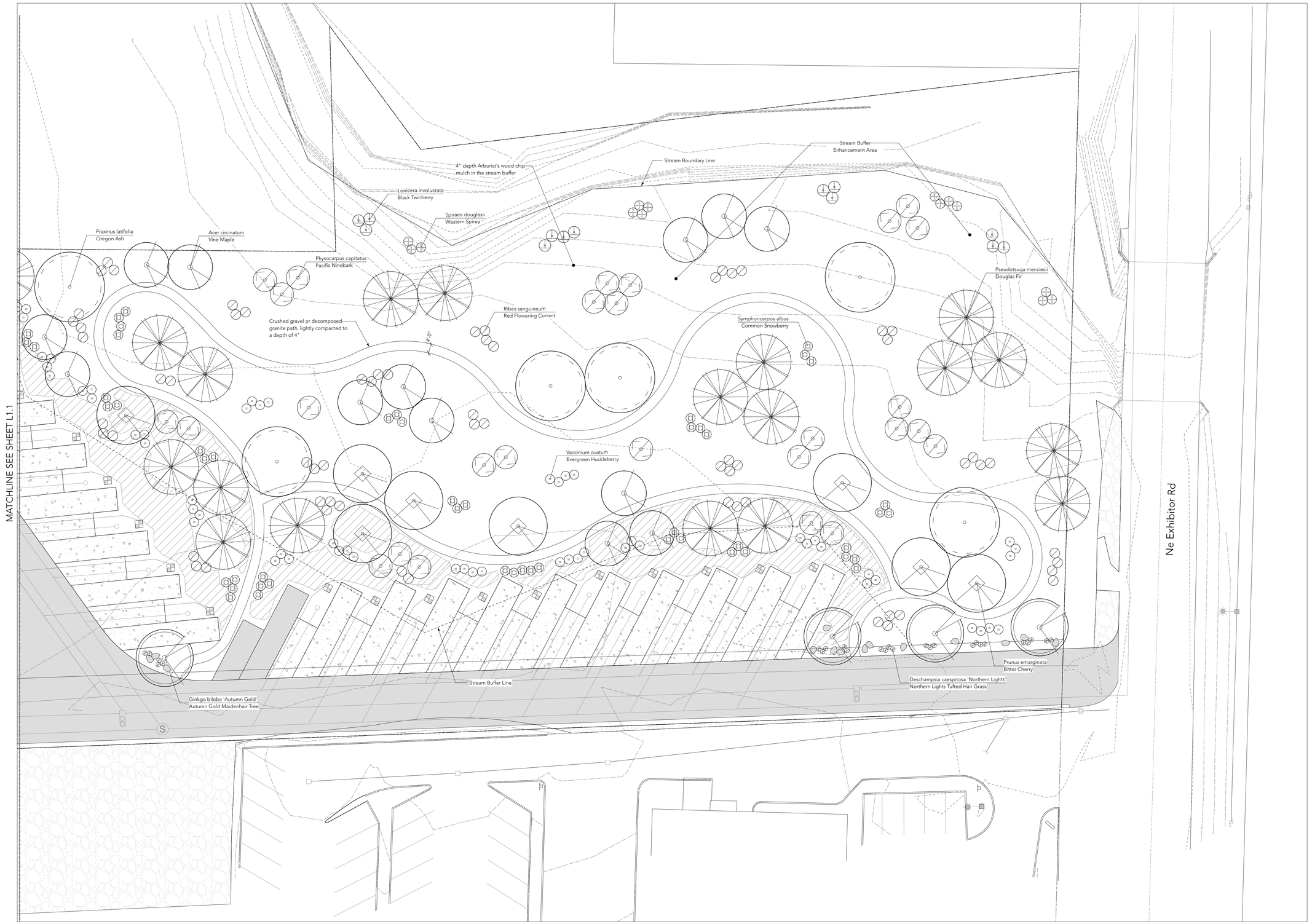

Client Logo:

FULLER DESIGNS

Hicks RV Park

0 Exhibitor Rd.
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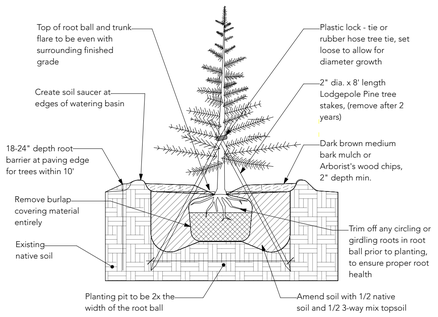
Plant Schedule

	Qty	Common Name	Botanical Name	Size & Spacing	Comments
Groundcover					
	257	Kinnikinick	Arctostaphylos uva-ursi	1 gal., 4' o.c.	Nursery grown, evergreen, native, small flowers in spring
Grasses					
	51	Northern Lights Tufted Hair Grass	Deschampsia caespitosa 'Northern Lights'	1 gal., 2' o.c.	Nursery grown, evergreen, trim back only as needed
Shrubs					
	13	Black Twinberry	Lonicera involucrata	2 gal., 5' o.c.	Nursery grown, deciduous, yellow flowers, attracts hummingbirds, do not top
	52	Common Snowberry	Symphoricarpos albus	2 gal., 4' o.c.	Nursery grown, deciduous, native, pink flowers in spring, white berries in fall, do not trim
	61	Evergreen Huckleberry	Vaccinium ovatum	2 gal., 4' o.c.	Nursery grown, evergreen, native, edible blue-black berries, do not top
	33	Pacific Ninebark	Physocarpus capitatus	2 gal., 10' o.c.	Nursery grown, deciduous, native, do not top
	67	Red Flowering Currant	Ribes sanguineum	2 gal., 4.5' o.c.	Nursery grown, deciduous, native, pink flower clusters
	14	Western Spirea	Spiraea douglasii	2 gal., 4' o.c.	Nursery grown, deciduous, native, do not top
Trees					
	5	Autumn Gold Maidenhair Tree	Ginkgo biloba 'Autumn Gold'	2" cal., 45' o.c.	B&B, nursery grown, golden fall foliage, do not top, street tree quality, branched at 5' height
	8	Bitter Cherry	Prunus emarginata	2" cal., 25' o.c.	B&B, nursery grown, deciduous, native, do not top
	23	Douglas Fir	Pseudotsuga menziesii	7-8' ht., 25' o.c.	B&B, nursery grown, evergreen, native, do not top
	6	Oregon Ash	Fraxinus latifolia	2" cal., as shown	Nursery grown, deciduous, native, evenly branched
	4	Paperbark Maple	Acer griseum	2" cal., as shown	B&B, nursery grown, street tree quality, branched at 5' height from the ground, evenly branched, do not top
	16	Vine Maple	Acer circinatum	7-8' ht., 20' o.c.	B&B, nursery grown, deciduous, native, multi-trunk, do not top

Total Number of Plants = 646

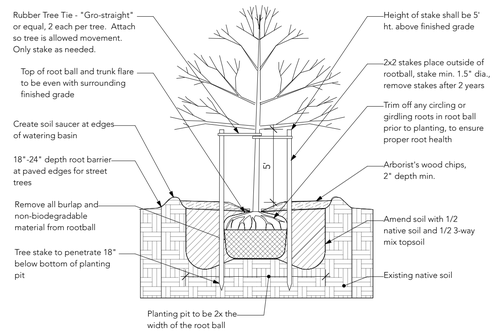
Materials Schedule

Item	Qty.	Notes
5/8" Crushed Gravel or Decomposed Granite Path, 850' length	42 Cy.	Compact lighlty to a depth of 4"
Three Way Mix Topsoil	1100 Cy.	Mix a 4" layer with 1/2 native soil into all new planting beds to a depth of 8"
Dark Brown Medium Bark Mulch or Arborist's Wood Chips for Plants Outside of the Stream Buffer	111 Cy.	Spread a 2" layer evenly around plants
Arborist's Wood Chips for Plants in the Stream Buffer	890 Cy.	Spread a 4" layer evenly around plants



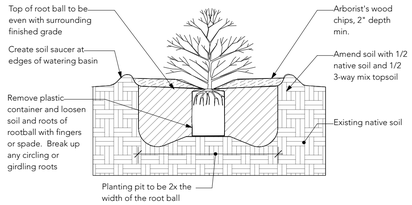
Notes:
1) Contractor to ensure roots are not kinked, circling, or girdling the trunk, prior to installation.
2) If roots are found to be defective, contractor to correct or replace plant material prior to installation.

Coniferous Tree Planting Detail
NTS

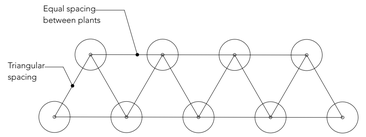


Notes:
1) Contractor to ensure roots are not kinked, circling, or girdling the trunk, prior to installation.
2) If roots are found to be defective, contractor to correct or replace plant material prior to installation.

Tree Planting Detail
NTS



Shrub/Ground Cover Planting Detail
NTS



Ground Cover Triangular Spacing Detail
NTS

Landscape Notes:

1. The landscape bed shall be free of weeds, rocks > 2"Ø, tree stumps and limbs, construction debris, slurry, and other construction material prior to soil preparation of planting beds.
3. The new planting bed shall be de-compacted by roto-tilling, disking or ripping to a depth of at least 8", to thoroughly loosen soil before adding compost to the beds.
4. Contractor to verify proposed tree locations in field and avoid underground and overhead utilities, and adjust tree locations as needed prior to digging.
5. Landscape Architect to be notified of any discrepancies between the planting plan and on site locations of buildings, paving, and utilities that may interfere with the proposed plant layout.
6. Contractor to evaluate soil conditions (pH level, nutrient content, etc..) and correct with proper soil amendment as needed.
7. Landscape Architect to be notified and approve of any plant substitutions prior to delivery. Plant material shall be delivered to the site free of diseases, pests, and damaged or broken branches, trunks or limbs.
9. All plants shall conform to the Z60.1 "American Standard for Nursery Stock" manual as published by the American Association of Nurseryman (AAN).
10. Contractor to guarantee all plants for 1 year and replace any dead or dying plants as notified by the owner.
11. Any damaged plant material delivered on site shall be returned and replaced by the grower or contractor.
12. Landscape Architect to review plant layout locations via photos or on site.
13. All deciduous and coniferous trees shall be placed and installed first, followed by all shrubs, and groundcover.
14. Fertilizer, herbicides, and pesticides are not required or needed for the survival of the newly installed plants.
15. All proposed plants should be allowed to grow naturally. Trimming is not needed, except for the occasional removal of broken, dead, damaged branches.
16. New plants shall be watered weekly in the first growing season or as needed, bi-weekly in the second growing season or as needed, and monthly in the third growing season or as needed, in the spring, summer, and fall months.
17. Check plants for burned or brown leaves, wilting branches or leaves, and dry soil during the summer months and apply irrigation as needed.

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Dripline (typ.)

Distribution Line (typ.)

1" mainline

Mainline shown for clarity, place in bed, aligned with paving

Provide sleeving, two times the pipe dia. (typ.)

Rain Sensor, attach to building on south or west side

Flow Sensor

Controller, wall mount metal cabinet

Backflow Preventor, provide City approved BFPV device

Ball Gate Valve, size to match meter

Drip Zone Control Valve (typ.)

1" Irrigation Meter, contractor to verify location in field

MATCHLINE SEE SHEET IR1.2

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IR1.2 of 6

IRRIGATION LEGEND

SYMBOL	MANUFACTURER/ DESCRIPTION	MODEL	COMMENTS
M	1" IRRIGATION METER (BY OTHERS COORDINATE P.O.C. WITH CONSTRUCTION MANAGER)		55 PSI STATIC PRESSURE
B	BRASS GATE VALVE	RUB BALL VALVE, S95F43 (ROUND HANDLE)	SIZE TO FIT MAINLINE
BFPV	1" BACK FLOW PREVENTOR	FEBCO 850	SIZE TO MATCH METER
R	HUNTER RAIN SENSOR	RAIN-CLIK-SGM	WIRELESS RAIN SENSOR W/GUTTER MOUNT
FS1	HUNTER 1" FLOW SENSOR	HFS W/ FCT-150	WIRE DIRECTLY TO CONTROLLER
X	HUNTER 1" AUTOMATIC CONTROL VALVE	ICV-101G WITH PRESSURE REGULATOR	WIRE DIRECTLY TO CONTROLLER, SEE VALVE KEY
A	HUNTER CONTROLLER	I-CORE, IC-600-M & (2) ICM-600 EXPANSION MODULES	WALL MOUNTED METAL CABINET

PIPE

SYMBOL	MANUFACTURER/ DESCRIPTION	MODEL	COMMENTS
----------	IRRIGATION MAIN LINE 1"	SCH 40 PVC	
————	IRRIGATION LATERAL LINE SIZE VARIES	SCH 40 PVC	SEE PIPE SIZING LEGEND
- - - - - - - - - - - - - - - - - - - -	PIPE AND WIRE SLEEVING	SCH 40 PVC	DIAMETER TO BE TWICE THE SIZE OF THE PIPE BEING SLEEVED

POP-UP HEADS AND ROTORS

SYMBOL	MANUFACTURER/ DESCRIPTION	RAD.	MODEL	PSI
	HUNTER MP ROTATOR SPRAY HEAD	8'	MP1000 CORNER HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	8'	MP1000 HALF HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	8'	MP1000 FULL HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	13'	MP1000 CORNER HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	13'	MP1000 HALF HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	13'	MP1000 FULL HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	18'	MP1000 CORNER HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	18'	MP1000 HALF HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	18'	MP1000 FULL HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	28'	MP3000 CORNER HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	28'	MP3000 HALF HEAD	35
	HUNTER MP ROTATOR SPRAY HEAD	28'	MP3000 FULL HEAD	35

DRIP LINES

SYMBOL	MANUFACTURER/ DESCRIPTION	MODEL	GPM	PSI
	HUNTER MICRO IRRIGATION DRIPLINE SYSTEM	HDL-09-24-250-CV 24" SPACING	.90 GPH	25
	DISTRIBUTION LINE	HDL-BLNK-250		25
X	HUNTER DRIP CONTROL ZONE KIT	ICZ 1"		25
V	HUNTER AIR RELIEF VALVE INSTALL ONE IN EACH ZONE	PLD-ARV		25
F	HUNTER AUTOMATIC FLUSH VALVE, INSTALL ONE IN EACH ZONE			25

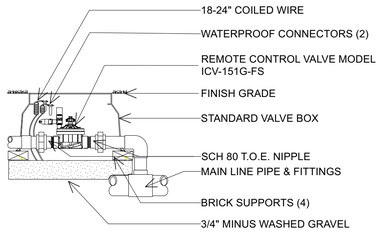
PIPE SIZING LEGEND	
3/4" SCH 40 PVC	(0-8 GPM)
1" SCH 40 PVC	(8-12 GPM)
1-1/4" SCH 40 PVC	(12-22 GPM)
1-1/2" SCH 40 PVC	(22-30 GPM)
2" SCH 40 PVC	(30-50 GPM)

CONTROLLER A VALVE KEY

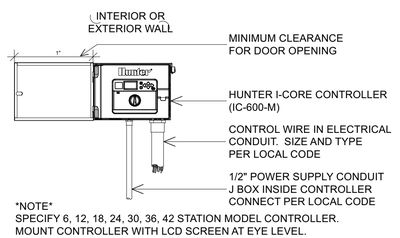
VALVE	SIZE	GPM	TYPE
1	1"	2.25	Drip
2	1"	4.9	Drip
3	1"	5.5	Drip
4	1"	3.2	Drip
5	1"	18.7	Spray Heads
6	1"	10.2	Drip
7	1"	14.5	Spray
8	1"	10.3	Drip
9	1"	14.8	Spray
10	1"	8.5	Drip
11	1"	5.6	Drip
12	1"	7.4	Drip
13	1"	9.5	Drip
14	1"	10.5	Drip
15	1"	8.6	Drip
16	1"	7.2	Drip
17	1"	19.6	Spray
18	1"	4.5	Drip

IRRIGATION NOTES:

1. Design assumes static water pressure at the source to be 50 PSI. Notify designer if PSI is below 50 PSI.
2. All irrigation laterals, driplines, valves, controllers, and mainlines are shown diagrammatically, align in planting beds next to paved areas.
3. Landscape architect is not responsible for correcting any irrigation connections, inconsistencies, or piping layout. Contractor is responsible for verifying all irrigation component locations and layout prior to construction.
4. Contractor to provide sleeving under all paved areas for irrigation piping.
5. Contractor to verify irrigation sleeve locations under all paving as needed to avoid underground utilities.
6. Group at least two control valves in valve boxes, locations shown on the plan are diagrammatic.
7. Rain sensor to be mounted on a west or south facing wall, metal cabinet, pole, or gutter.
8. Contractor to verify irrigation P.O.C, and at least 50 PSI at the source, and install approved backflow prevention device.
9. Contractor to verify irrigation system is functioning properly and will provide full coverage for all planting areas.
10. Water new plants immediately after installation, and every other day during the spring and summer months, and as needed in the fall.
11. All plants and lawn areas shall be watered for the first three seasons to help plant roots get established. After three seasons, reduce the amount of irrigation applied. Only run irrigation during drought and/or hot summer days.

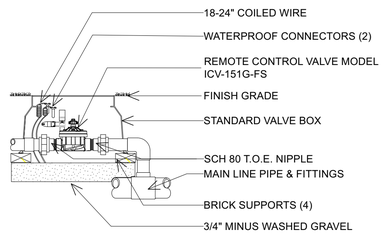


ICV GLOBE VALVE
NTS

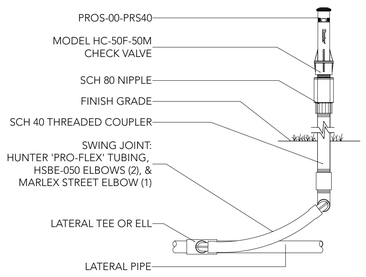


NOTE
SPECIFY 6, 12, 18, 24, 30, 36, 42 STATION MODEL CONTROLLER.
MOUNT CONTROLLER WITH LCD SCREEN AT EYE LEVEL.
CONTROLLER SHALL BE HARD-WIRED TO GROUNDED 110 or 220 VAC SOURCE.

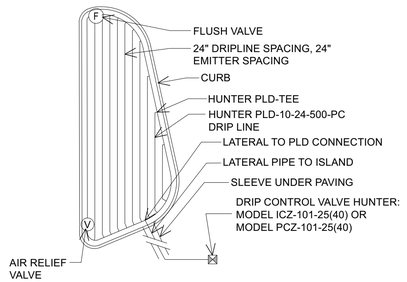
METAL CONTROLLER DETAIL
NTS



ICZ DRIP CONTROL ZONE KIT
NTS



MP ROTATOR SPRINKLER DETAIL
NTS



DRIPLINE LAYOUT DETAIL
NTS

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SECTION 8 – OPERATION AND MAINTENANCE MANUAL

The Following pages contain maintenance needs for most of the components that are part of your drainage system, as well as components that you may not have. Let us know if there are any components that are missing from these pages. Ignore the requirements that do not apply to your system. You should plan to complete a checklist for all system components on the following schedule

1. Monthly from November through April
2. Once in late summer (preferably September).
3. After any major storm (use 1" of precipitation in 24 hours) for any items marked "S".

Using photocopies of these pages, check off the items you looked for after each inspection. Add comments on issues found and actions taken. Keep these records in your files. These files will be needed to write your annual report if required. Some items may not need to be looked at every time an inspection is done. Use the suggest frequency at the left of each item as a guideline for your inspection.

You may call the jurisdiction for technical assistance. Please do not hesitate to call, especially if you are unsure whether a situation you have discovered may be a developing issue.

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.21: Maintenance Standards - Bioretention Facilities (continued)

Maintenance Component	Recommended Frequency [a]		Condition when Maintenance is Needed (Standards)	Action Needed (Procedures)
	Inspection	Routine Maintenance		
Erosion control at inlet	A		Concentrated flows are causing erosion	Maintain a cover of rock or cobbles or other erosion protection measure (e.g., matting) to protect the ground where concentrated water enters the facility (e.g., a pipe, curb cut or swale)
Trash rack	S		Trash or other debris present on trash rack	Remove/dispose
	A		Bar screen damaged or missing	Repair/replace
Overflow	A, S		Capacity reduced by sediment or debris	Remove sediment or debris/dispose
Underdrain pipe	Clean pipe as needed	Clean orifice at least biannually (may need more frequent cleaning during wet season)	• Plant roots, sediment or debris reducing capacity of underdrain • Prolonged surface ponding (see "Ponded water"	• Jet clean or rotary cut debris/roots from underdrain(s) • If underdrains are equipped with a flow restrictor (e.g., orifice) to attenuate flows, the orifice must be cleaned regularly.
Vegetation				
Facility bottom area and upland slope vegetation	Fall and Spring		Vegetation survival rate falls below 75% within first two years of establishment (unless project O&M manual or record drawing stipulates more or less than 75% survival rate).	• Determine cause of poor vegetation growth and correct condition • Replant as necessary to obtain 75% survival rate or greater. Refer to original planting plan, or approved jurisdictional species list for appropriate plant replacements (See Appendix 3 - Bioretention Plant List, in the *LID Technical Guidance Manual for Puget Sound*, (Hinman and Wulkan, 2012)). • Confirm that plant selection is appropriate for site growing conditions • Consultation with a landscape architect is recommended for removal, transplant, or substitution of plants
Vegetation (general)	As needed		Presence of diseased plants and plant material	• Remove any diseased plants or plant parts and dispose of in an approved location (e.g., commercial landfill) to avoid risk of spreading the disease to other plants • Disinfect gardening tools after pruning to prevent the spread of disease • See the *Pacific Northwest Plant Disease Management Handbook* (Pscheidt and Ocamb, 2016) for information on disease recognition and for additional resources • Replant as necessary according to recommendations provided for "facility bottom area and upland slope vegetation".
Trees and shrubs		All pruning seasons (timing varies by species)	Pruning as needed	• Prune trees and shrubs in a manner appropriate for each species. Pruning should be performed by landscape professionals familiar with proper pruning techniques • All pruning of mature trees should be performed by or under the direct guidance of an ISA certified arborist
	A		Large trees and shrubs interfere with operation of the facility or access for maintenance	• Prune trees and shrubs using most current ANSI A300 standards and ISA BMPs. • Remove trees and shrubs, if necessary.
	Fall and Spring		Standing dead vegetation is present	• Remove standing dead vegetation • Replace dead vegetation within 30 days of reported dead and dying plants (as practical depending on weather/planting season) • If vegetation replacement is not feasible within 30 days, and absence of vegetation may result in erosion problems, temporary erosion control measures should be put in place immediately. • Determine cause of dead vegetation and address issue, if possible

SECTION 9 – DRAFT STORMWATER MAINTENANCE AGREEMENT

The following pages contain a draft maintenance agreement to be completed prior to final approval. Upon completion of road construction and stormwater facilities; a signed agreement will be executed, and a copy provided to the City of Chehalis.

AFTER RECORDING RETURN TO:

Kevin & Melody Hicks

PO Box 500

Rainier, WA 98576

PLEASE PRINT OR TYPE ALL INFORMATION DOCUMENT TITLE(S) (OR TRANSACTIONS CONTAINED THEREIN):
Stormwater Maintenance Agreement

REFERENCE NUMBER(S) OF DOCUMENTS ASSIGNED/RELEASED:

GRANTOR/BORROWER (LAST NAME FIRST, FIRST NAME AND INITIALS):
Kevin & Melody Hicks

ADDITIONAL NAMES LISTED ON PAGE N / A OF DOCUMENT.

GRANTEE/ASSIGNEE/BENEFICIARY (LAST NAME FIRST, FIRST NAME AND INITIALS):
City of Washington, Chehalis

ADDITIONAL NAMES LISTED ON PAGE N / A OF DOCUMENT.

LEGAL DESCRIPTION (ABBREVIATED: I.E. LOT, BLOCK, PLAT OR SECTION, TOWNSHIP, RANGE)
Section 17, Township 14N, Range 02W

COMPLETE LEGAL DESCRIPTION IS LISTED ON PAGE N / A OF DOCUMENT.

ASSESSOR'S TAX PARCEL NUMBER(S)

005605080007

THE AUDITOR/RECORDER WILL RELY ON THE INFORMATION PROVIDED ON THIS FORM. THE STAFF WILL NOT READ THE DOCUMENT TO VERIFY THE ACCURACY OR COMPLETENESS OF THE INDEXING INFORMATION PROVIDED HEREIN.

Parcel Number(s): 005605080007
Name: Hicks RV Park
Address: 0 Exhibitor Rd., Chehalis, WA

THIS AGREEMENT, made this_____day of_____, 20 , by and between Mike and Patricia Duch, hereinafter referred to as the "Owners(s)" of the following property and Lewis County hereinafter referred to as the "County".

WITNESSETH, that

WHEREAS, Owner has submitted for approval by County a permit application and Site Plan for the construction and installation of stormwater management facilities pursuant to County Code chapter 15.45; and

WHEREAS, the County Code requires, as a condition of permit approval, a maintenance agreement between the County and the Owner ensuring the Owner constructs and maintains the stormwater facilities identified in the Site Plan.

THEREFORE, the Owner of certain real property, with full authority to execute deeds, mortgages, other covenants, do hereby covenant with the County and agree as follows:

1. Owner shall construct and install stormwater management facilities as depicted and shown on the Record Drawings for the above referenced parcel number(s)

2. Owner shall continuously maintain the stormwater management facilities as shown on the Site Plan in good working order and as specified in the maintenance schedule.

3. Owner hereby grants County, its authorized agents and employees, to enter onto the Property to inspect the stormwater facilities pursuant to Chapter 15.45 of the County Code.

4. In the event Owner fails to maintain the stormwater management facilities as shown on the Site Plan in good working order acceptable to the County, the County may enter the Property and take whatever steps deemed necessary and appropriate to maintain (including repair or replace) said stormwater facilities. It is expressly understood and agreed that the County is under no obligation to maintain or repair or replace said facilities, and in no event shall this Agreement be construed to impose such an obligation on the County.

5. In the event that the County performs work of any nature pursuant to section 4 of this agreement or expends any funds in performance of such work for labor, equipment, supplies or materials, Owner shall reimburse County for all reasonable costs incurred. Owner, its executors, administrators, assigns, heirs, and any other successors in interest, shall reimburse County for all costs within thirty (30) days of Owner's receipt of written

demand by the County for reasonable costs incurred, including but not limited to attorney fees, collection costs, and interest at the statutory rate.

6. It is the intent of this Agreement to ensure the continuous and proper maintenance of stormwater management facilities by the Owner, its heirs, successors and assigns; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or caused by stormwater management.

7. Owner, its executors, administrators, assigns, and any other successors in interest, shall indemnify and hold the County, its agents and employees harmless from any and all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against County, its agents or employees, from the construction, presence, existence, or maintenance, of the stormwater management facilities by Owner.

8. This Agreement shall be recorded among the land records of Lewis County, Washington, and shall constitute a covenant running with the land, and shall be binding upon Owner, its administrators, executors, assigns, heirs, and any other successor in interest.

Date : _____ Signature: _____

Name: _____

Title: _____

State of Washington

County of _____

I certify that I know or have satisfactory evidence that_____(name of person) is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated:_____

(Seal or stamp)

_____
Signature

_____
Title

My appointment expires:____