

## **APPENDIX D**

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PROJECT ACCESS DATABASE (Upon Request)  
BIOLOGICAL TESTING RESULTS



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Remedial Investigation  
 Little Squalicum Park, Bellingham, WA  
 Appendix D. Project Access Database (CD), Biological Testing Results

Table D-1. 10-day Amphipod Sediment Toxicity Test Results

Sample	<i>Hyalella azteca</i>	
	Mean Survival (%)	Mean Dry Weight per Organism (mg)
Lab Control	88	0.1
SD9 (Reference)	91	0.24
SD1	88	0.18
SD2	90	0.13
SD3	93	0.15
SD4	78	0.18
SD5	81	0.14
SD6	93	0.2
SD7	83	0.2
SD8	93	0.16
SD10	93	0.15

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Table D-2. 28-day Oligochaete Sediment Bioaccumulation Test Results

<b><i>Lumbriculus varietagus</i></b>				
<b>Sample</b>	<b>Replicate</b>	<b>Tissue Weight (g)</b>	<b>Mean Tissue Weight (g)</b>	<b>Sediment TOC (%)</b>
Lab Control	A	9.84	8.89	unknown
	B	9.79		
	C	9.75		
	D	7.99		
	E	7.1		
SD2	A	3.36	3.69	1.3
	B	3.69		
	C	5.24		
	D	3.3		
	E	2.85		
SD5	A	3	2.89	1.8
	B	2.47		
	C	3.08		
	D	4.64		
	E	1.24		
SD6	A	7.98	11.21	11
	B	6.19		
	C	10.26		
	D	14.24		
	E	17.36		

## Remedial Investigation

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## Appendix D. Project Access Database (CD), Biological Testing Results

Table D-3. Sediment Oligochaete Tissue Concentrations

	Location Study	<i>Lumbriculus variegatus</i>			Sediment		
		SD2 & SD5 RI	SD6 RI	Laboratory Control RI	SD2 RI	SD5 RI	SD6 RI
<b>Dioxins</b>							
1,2,3,4,7,8-HxCDD	ng/Kg	<b>7.394</b>	NA	0.203 U	3.81	4.95	<b>16.7</b>
1,2,3,6,7,8-HxCDD	ng/Kg	<b>119.97</b>	NA	0.14 U	<b>223</b>	<b>30</b>	<b>79.6</b>
1,2,3,4,6,7,8-HpCDD	ng/Kg	<b>1883.7 J</b>	NA	1.907 UJ	<b>10100</b>	<b>978</b>	<b>25100</b>
1,2,3,4,6,7,8-HpCDF	ng/Kg	<b>292.16</b>	NA	0.193 U	<b>1950</b>	<b>163</b>	<b>421</b>
1,2,3,4,7,8,9-HpCDF	ng/Kg	<b>15.07</b>	NA	0.275 UJ	<b>68.3</b>	<b>10.7</b>	<b>31.6</b>
OCDD	ng/Kg	<b>16282.4</b>	NA	20.121 UJ	<b>126000</b>	<b>60200</b>	<b>304000</b>
OCDF	ng/Kg	<b>856.7</b>	NA	0.801 UJ	<b>11500</b>	<b>1210</b>	<b>39400</b>
Total TCDD	ng/Kg	<b>11.2</b>	NA	0.128 U	<b>3.4</b>	0.345	<b>2.23</b>
Total TCDF	ng/Kg	<b>30.1</b>	NA	0.182 U	<b>23</b>	<b>0.558</b>	<b>1.74</b>
Total PeCDD	ng/Kg	<b>6.8</b>	NA	0.197 U	<b>5.6</b>	<b>1.25</b>	<b>9.85</b>
Total PeCDF	ng/Kg	<b>231.3</b>	NA	0.166 U	<b>337</b>	<b>31.9</b>	<b>90.9</b>
Total HxCDD	ng/Kg	<b>346.8</b>	NA	0.14 U	<b>820</b>	<b>130</b>	<b>381</b>
Total HxCDF	ng/Kg	<b>982.5</b>	NA	0.141 U	<b>1800</b>	<b>175</b>	<b>473</b>
Total HpCDD	ng/Kg	<b>3346.2</b>	NA	<b>1.36</b>	<b>18500</b>	<b>1780</b>	<b>43500</b>
Total HpCDF	ng/Kg	<b>307.2</b>	NA	<b>1.27</b>	<b>1950</b>	<b>174</b>	<b>453</b>
TEQ (ND=0.5 DL)	ng/Kg	<b>36.36</b>	NA	NA	<b>320.96</b>	<b>81.25</b>	<b>624.13</b>
<b>SVOCs</b>							
2,4,6-Trichlorophenol	mg/kg	NA	<b>0.74 J</b>	0.13 U	0.013	0.013	0.031
2-Methylphenol	mg/kg	NA	<b>1 J</b>	0.13 U	0.013	0.013	0.031
3&4-Methylphenol	mg/kg	NA	<b>3.3 J</b>	<b>0.27 J</b>	0.013	<b>0.012</b>	<b>0.1</b>
Anthracene	mg/kg	NA	<b>0.37</b>	0.027 U	<b>2.2</b>	<b>0.061</b>	<b>0.56</b>
Benzo(a)anthracene	mg/kg	NA	<b>0.17 J</b>	0.027 U	<b>3.7</b>	<b>0.12</b>	<b>1.7</b>
Benzo(a)pyrene	mg/kg	NA	<b>0.4</b>	0.027 U	<b>2.4</b>	<b>0.34</b>	<b>1.4</b>
Benzo(b)fluoranthene	mg/kg	NA	<b>0.28 J</b>	0.027 U	<b>0.82</b>	<b>0.15</b>	<b>0.7</b>
Benzo(j)fluoranthene	mg/kg	NA	<b>0.28 J</b>	0.27 U			
Benzo(k)fluoranthene	mg/kg	NA	<b>0.28 J</b>	0.027 U	<b>0.82</b>	<b>0.15</b>	<b>0.7</b>
Benzoic acid	mg/kg	NA	<b>5.3 J</b>	0.27 U	0.026	0.026	0.061
Benzyl alcohol	mg/kg	NA	<b>13 J</b>	<b>1.5 J</b>	0.013	0.013	0.031
Chrysene	mg/kg	NA	<b>0.46 J</b>	0.027 U	<b>8.3</b>	<b>0.23</b>	<b>2.2</b>
Fluoranthene	mg/kg	NA	<b>1.3</b>	0.027 U	<b>0.47</b>	<b>0.1</b>	<b>3.2</b>
Naphthalene	mg/kg	NA	<b>0.11</b>	0.027 U	<b>0.024</b>	<b>0.0058</b>	<b>0.025</b>
Pentachlorophenol	mg/kg	NA	<b>2.1 J</b>	0.13 UJ	<b>0.033</b>	<b>0.056</b>	<b>0.46</b>
Phenanthrene	mg/kg	NA	<b>0.48</b>	0.027 U	<b>0.61</b>	<b>0.041</b>	<b>0.41</b>
Phenol	mg/kg	NA	<b>0.34 J</b>	0.13 U	0.013	0.013	0.031
Pyrene	mg/kg	NA	<b>0.43 J</b>	0.027 U	<b>0.66</b>	<b>0.096</b>	<b>2.9</b>
Tetrachlorophenols	mg/kg	NA	<b>4 J</b>	0.13 U	<b>0.0054</b>	0.013	<b>0.079</b>

Notes: NA = not applicable

Bold font indicates detected concentrations

Table D-4. Berry Tissue Concentrations

	<b>Sample Location</b>	99070520 Berry 1	99070521 Berry 1	99070522 Berry 2	99070523 Berry 2	99070524 Berry 3	99070525 Berry 3	99070524 Berry 4 (Reference)	99070525 Berry 4 (Reference)
	<b>Treatment Study Date</b>	Washed RI 8/20/1999	Unwashed RI 8/20/1999	Washed RI 8/20/1999	Unwashed RI 8/20/1999	Washed RI 8/20/1999	Unwashed RI 8/20/1999	Washed RI 8/20/1999	Unwashed RI 8/20/1999
<b>Dioxins</b>									
1,2,3,4,6,7,8-HpCDD	ng/Kg	1.50 U	3.19 U	1.59 U	<b>2.7</b>	2.21 U	<b>1.07</b>	0.92 U	0.92 U
OCDD	ng/Kg	<b>14.47</b>	<b>30.42</b>	<b>17.84</b>	<b>31.07</b>	<b>22.02</b>	<b>9.45</b>	10.89 U	<b>17.72</b>
OCDF	ng/Kg	1.36 U	<b>2.72</b>	1.46 U	<b>2.91</b>	1.04 U	2.52 U	0.91 U	0.87 U
Total HpCDD	ng/Kg	1.50 U	0.60 U	1.59 U	<b>5.04</b>	1.20 U	<b>1.07</b>	0.92 U	0.92 U
TEQ (ND=0.5 DL)	ng/Kg	<b>0.001</b>	<b>0.003</b>	<b>0.002</b>	<b>0.3</b>	<b>0.002</b>	<b>0.012</b>	NA	<b>0.002</b>
<b>VOCs</b>									
p-Isopropyltoluene	mg/kg	<b>0.003</b>	<b>0.0067</b>	<b>0.013</b>	<b>0.015 J</b>	<b>0.012 J</b>	<b>0.018</b>	<b>0.027 J</b>	<b>0.013</b>
Styrene	mg/kg	0.003 U	<b>0.00034 J</b>	<b>0.00018 J</b>	<b>0.00022 J</b>	<b>0.0013</b>	<b>0.0022</b>	<b>0.0045</b>	<b>0.00061</b>
<b>SVOCs</b>									
1,2,3-Trichlorobenzene	mg/kg	0.003 U	0.00036 U	0.00036 U	0.00032 UJ	0.00032 UJ	0.00034 U	<b>0.00033</b>	0.00035 U
2-Methylnaphthalene	mg/kg	0.0013 U	0.0019 U	<b>0.0017</b>	<b>0.002</b>	<b>0.0017</b>	<b>0.0011 J</b>	0.0013 U	0.0013 U
Benzoic acid	mg/kg	0.013 U	<b>0.032</b>	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U
Benzyl alcohol	mg/kg	<b>0.056</b>	<b>0.06</b>	0.0065 U	<b>0.04</b>	<b>0.063</b>	<b>0.063</b>	0.0063 U	0.0065 U
Fluoranthene	mg/kg	<b>0.0047</b>	<b>0.0058</b>	0.0013 U	0.0027 U	<b>0.0012 J</b>	0.0013 U	<b>0.0041</b>	0.0013 U
Fluorene	mg/kg	<b>0.0032</b>	<b>0.0033</b>	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Naphthalene	mg/kg	<b>0.0003</b>	<b>0.00036</b>	0.00036 U	0.00032 UJ	0.00032 UJ	0.00034 U	0.00033 U	0.00035 U
Phenanthrene	mg/kg	<b>0.015</b>	<b>0.016</b>	<b>0.0087</b>	<b>0.0072</b>	<b>0.0053</b>	<b>0.0053</b>	<b>0.0086</b>	<b>0.011</b>
Phenol	mg/kg	0.0066 U	<b>0.004 J</b>	0.0065 U	0.0065 U	0.0065 U	<b>0.009</b>	0.0063 U	0.0065 U
Pyrene	mg/kg	0.0013 U	<b>0.0037</b>	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U

Notes: NA = not applicable

Bold font indicates detected concentrations

Table D-5. Ecology Sediment Toxicity Test Results

Site	10-day Amphipod ( <i>Hyalella azteca</i> )			20-day Midge ( <i>Chironomus tentans</i> )						Microtox	
	Mean % Survival	Mean RPD % Survival	Compared to Control p-values <sup>a</sup> Survival	Mean % Survival	Mean RPD % Survival	Mean Weight per Org (mg)	T/C Mean Weight per Org (mg)	Control p-values <sup>a</sup> Survival Growth		Light Reading $I_{(15)}/I_{(0)}$	Mean Change $T_{(15)}/C_{(15)}$
Control	88	NA	NA	96	NA	1.044	NA	NA	NA	0.89/0.93 <sup>b</sup>	NA
LSC-01	80	10	0.091	86	11	1.564	1.5	0.052	---	0.90	1.01
LSC-02	79	11	0.208	60	46	1.824	1.7	0.001	---	0.93	1.03
LCS-03	0	200	<0.001	0	200	NA	NA	<0.001	<0.001	1.08	0.42
LSC-04	70	23	0.029	80	18	2.005	1.9	0.100	---	0.97	1.03
LCS-05	84	5	0.327	84	13	1.927	1.8	0.210	---	0.95	0.78
LSC-06	67	27	0.015	82	16	2.113	2.0	0.093	---	0.99	0.78

Notes: <sup>a</sup> One-tailed t-test. Survival data arcsine square-root transformation prior to t-test.

<sup>b</sup> Microtox test were run in two batches. Test samples LSC01, LSC-02 and LSC-03 were run with a control in the first batch and test samples LSC-04, LSC-05, and LSC-06 were run with a control in the second batch. Only control batch results are presented.

NA-Not Available or Not Applicable

--- Site response greater than control sediment response.

$I_{(0)}$  is the light reading after the initial five minute incubation period

$I_{(15)}$  is the light reading fifteen minutes after  $I_{(0)}$

$C_{(t)}$  and  $T_{(t)}$  are the changes in light readings from the initial reading in each sample container for the control and test sites.  $I_{(t)}/I_{(0)}$

T = test sample

C = Control sample

RPD = relative percent difference

RPD =  $((T-C)/((T+C)/2))*100$