WAC 173-204-563 Sediment cleanup levels based on protection of the benthic community in freshwater sediment. (1) **Applicability.** This section defines sediment cleanup objectives and cleanup screening levels for contaminants based on protection of the benthic community in freshwater sediment. They are used to:

(a) Identify and assess the hazard of sites under WAC 173-204-510 and 173-204-520; and

(b) Establish sediment cleanup levels for sites and sediment cleanup units under WAC 173-204-560.

(2) **Freshwater sediment - Chemical criteria.** The chemical concentration criteria in Table VI establish the sediment cleanup objectives and cleanup screening levels chemical criteria for freshwater sediment. The criteria of this section shall apply to freshwater sediments for toxicity to the benthic community.

(a) The sediment cleanup objectives of this section establish a no adverse effects level, including no acute or chronic adverse effects, to the benthic community. Chemical concentrations at or below the sediment cleanup objectives correspond to sediment quality that results in no adverse effects to the benthic community.

(b) The cleanup screening levels of this section establish a minor adverse effects level, including acute or chronic effects, to the benthic community. Chemical concentrations at or below the cleanup screening level but greater than the sediment cleanup objective correspond to sediment quality that results in minor adverse effects to the benthic community. The freshwater chemical and biological cleanup screening levels establish minor adverse effects as the level above which station clusters of potential concern are defined and may be defined as potential cleanup sites for benthic community toxicity, and at or below which station clusters of low concern are defined, per the procedures identified in WAC 173-204-510 and 173-204-520.

(c) The cleanup screening level chemical criteria is exceeded when the sediment chemical concentration for an individual chemical is above the cleanup screening level in Table VI.

(d) The sediment cleanup objective chemical criteria is exceeded when the sediment chemical concentration for an individual chemical is above the sediment cleanup objective in Table VI.

(e) For purposes of this section, where chemical analyses indicate a chemical is not detected in a sediment sample, the method detection limit and the practical quantitation limit shall be reported and shall be at or below the freshwater sediment cleanup objectives chemical criteria value in Table VI.

(f) Where chemical criteria in Table VI represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where chemical analyses identify an undetected value for every individual compound/isomer, then the single highest detection limit shall represent the sum of the respective compounds/isomers; and

(ii) Where chemical analyses detect one or more individual compound/isomers, only the detected concentrations will be added to represent the group sum.

(g) The chemical criteria in Table VI represent concentrations as dry weight.

(h) The total polycyclic aromatic hydrocarbon (PAH) criterion in Table VI represents the sum of the following polycyclic aromatic hydrocarbon compounds: 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(ghi)perylene, chrysene, dibenz(ah)anthracene, fluoranthene,

fluorene, indeno(123-cd)pyrene, naphthalene, phenanthrene, pyrene, total benzofluoranthenes (b+k+j).

(i) The total benzofluoranthenes criterion in Table VI represents the sum of the concentrations of the "B," "J," and "K" isomers.

(j) The total dichlorodiphenyldichloroethane (DDDs) criterion in Table VI represents the sum of the following DDD isomers: o,p'-DDD and p,p'-DDD.

(k) The total dichlorodiphenyldichloroethylene (DDEs) criterion in Table VI represents the sum of the following DDE isomers: o,p'-DDE and p,p'-DDE.

(l) The total dichlorodiphenyltrichloroethane (DDTs) criterion in Table VI represents the sum of the following DDT isomers: o,p'-DDT, p,p'-DDT.

(m) The total polychlorinated biphenyl (PCB) Aroclors criterion in Table VI represents the sum of the following Aroclors: 1016, 1221, 1242, 1248, 1254, 1260, 1268.

(n) When the listed chemical criteria in Table VI have a ">" (greater than) value for the cleanup screening level, the cleanup screening level is unknown but is above the concentration shown. If test results show concentrations above this cleanup screening level, bioassays shall be conducted to evaluate potential benthic community toxicity.

(o) The department recognizes that, in the following types of freshwater sediment environments, the chemical criteria in Table VI may not reliably predict benthic community toxicity:

(i) Sediment with unusual geochemical or biochemical characteristics influencing toxicity (release or bioavailability of contaminants) including total organic carbon in environments such as bogs and alpine wetlands;

(ii) Sediment with pore water or overlying water that has unusual geochemical or biochemical characteristics influencing toxicity (release or bioavailability of contaminants) including pH or hardness;

(iii) Sediment impacted by metals mining, metals milling, or metals smelting; and

(iv) Sediment impacted by other toxic, radioactive, biological, or deleterious substances as specified in subsection (4) of this section.

(p) At a site where the freshwater sediment environment meets the categories specified in (o)(i) or (ii) of this subsection, the department may require alternative methods for characterizing benthic community toxicity. At a site where the freshwater sediment environment meets the categories specified in (o)(iii) or (iv) of this subsection, an alternative method for characterizing benthic community toxicity shall be required. The alternative method used shall be the biological criteria of subsection (3)(a) through (h) of this section, unless the department determines one of the following methods are consistent with the provisions in subsection (3)(a) through (h) of this section:

(i) Establishing site-specific chemical criteria using site chemistry and the biological criteria of subsection (3)(a) through (h) of this section;

(ii) Other biological methods approved by the department; or

(iii) Other approaches in accordance with WAC 173-204-130.

Table VI
Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels
Chemical Criteria

Chemical Parameter	Dry Weight Sediment Cleanup Objective	Dry Weight Cleanup Screening Level
Conventional chemicals (mg/kg)		
Ammonia	230	300
Total sulfides	39	61
Metals (mg/kg)		
Arsenic	14	120
Cadmium	2.1	5.4
Chromium	72	88
Copper	400	1200
Lead	360	> 1300
Mercury	0.66	0.8
Nickel	26	110
Selenium	11	> 20
Silver	0.57	1.7
Zinc	3200	> 4200
Organic chemicals (µg/kg)		
4-Methylphenol	260	2000
Benzoic acid	2900	3800
Beta-Hexachlorocyclohexane	7.2	11
Bis(2-ethylhexyl) phthalate	500	22000
Carbazole	900	1100
Dibenzofuran	200	680
Dibutyltin	910	130000
Dieldrin	4.9	9.3
Di-n-butyl phthalate	380	1000
Di-n-octyl phthalate	39	> 1100
Endrin Ketone	8.5	> 8.5
Monobutyltin	540	> 4800
Pentachlorophenol	1200	> 1200
Phenol	120	210
Tetrabutyltin	97	> 97
Total PCB Aroclors	110	2500
Total DDDs	310	860
Total DDEs	21	33
Total DDTs	100	8100
Total PAHs	17000	30000
Tributyltin	47	320

Chemical Parameter	Dry Weight	Dry Weight
	Sediment Cleanup Objective	Cleanup Screening Level
Bulk Petroleum Hydrocarbons (mg/kg)		
Total Petroleum Hydrocarbon (TPH)-Diesel	340	510
Total Petroleum Hydrocarbon (TPH)-Residual	3600	4400

(3) **Freshwater sediment - Biological criteria.** The biological effects criteria in Table VII establish the sediment cleanup objectives and cleanup screening levels biological criteria for freshwater sediment. The criteria of this section shall apply to freshwater sediments for toxicity to the benthic invertebrate community.

(a) The sediment cleanup objectives of this section establish a no adverse effects level, including no acute or chronic adverse effects, to the benthic community. The sediment cleanup objective biological criteria for a sampling station is exceeded when one of the biological test results is above the sediment cleanup objective as described in Table VII.

(b) The cleanup screening levels of this section establish a minor adverse effects level, including acute or chronic effects, to the benthic community. The cleanup screening level biological criteria for a sampling station is exceeded when:

(i) Any two of the biological test results for a sampling station are above the sediment cleanup objective in Table VII; or

(ii) One of the biological test results for a sampling station is above the cleanup screening level as described in Table VII.

(c) The acute and chronic effects biological tests of Table VIII shall be used to:

(i) Confirm designation of freshwater sediment for benthic toxicity. The department may require, or any person may perform, biological testing to confirm the designation of freshwater sediment which either passes or fails the chemical criteria in subsection (2) of this section. The sediment shall be tested using the procedures in (d) of this subsection;

(ii) Evaluate the freshwater sediment cleanup objective and cleanup screening level for identifying sediment station clusters of potential concern for benthic community toxicity using the procedures in WAC 173-204-510(2); and

(iii) Establish the freshwater sediment cleanup objective or cleanup screening level for identifying station clusters of low concern for benthic community toxicity using the procedures in WAC 173-204-510(2).

(d) To designate sediment quality using biological criteria, a minimum of the following shall be included in the suite of biological tests for each sediment sample as described in Table VIII:

(i) Two different species;

(ii) Three endpoints;

(iii) One chronic test; and

(iv) One sublethal endpoint.

(e) The appropriate control and reference sediment samples shall meet the performance standards described in Table VII. Selection and use of reference sediment must be approved by the department and shall meet the performance standards of Table VII. The department may approve a different performance standard based on latest scientific knowledge.

(f) When sediment is collected to conduct the biological tests in Table VIII or other biological tests approved by the department, the overlying site water shall be collected and analyzed for pH, hardness, and temperature.

(g) Use of alternate biological tests may be required by the department and shall be subject to the review and approval of the department using the procedures of WAC 173-204-130(4).

(h) Any person who designates test sediments using the procedures of this section shall meet the sampling and testing plan requirements of WAC 173-204-600 and records management requirements of WAC 173-204-610. Test sediments designated using the procedures of this section shall be sampled and analyzed using methods approved by the department, and shall use an appropriate quality assurance/quality control program, as determined by the department.

(4) **Freshwater sediment - Other toxic, radioactive, biological, or deleterious substances criteria.** "Other toxic, radioactive, biological, or deleterious substances" means substances not specified in Table VI that are in, or on, sediments and cause minor adverse effects to biological resources, as determined in subsection (3) of this section. The department shall determine on a case-by-case basis other criteria, methods, and procedures, such as those listed in subsection (2)(p) of this section, necessary to meet the criteria in subsection (3) of this section.

Table VII
Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels
Biological Criteria

Biological Test/ Endpoint*	Performance Standard*		Sediment Cleanup Objective for each biological test	Cleanup Screening Level for each biological test
	Control*	Reference		
Hyalella azteca				
10-day mortality	$M_C \leq 20\%$	$M_R \leq 25\%$	$M_T - M_C > 15\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 25\%$ and M_T vs M_C SD ($p \leq 0.05$)
28-day mortality	$M_C \leq 20\%$	$M_R \leq 30\%$	$M_T - M_C > 10\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 25\%$ and M_T vs M_C SD ($p \leq 0.05$)
28-day growth	$MIG_C \geq 0.15$ mg/individual	$MIG_R \geq 0.15$ mg/individual	$(MIG_C - MIG_T)/MIG_C > 0.25$ and MIG_T vs MIG_C SD ($p \leq 0.05$)	$(MIG_C - MIG_T)/MIG_C > 0.40$ and MIG_T vs MIG_C SD ($p \leq 0.05$)
Chironomus dilutus				
10-day mortality	$M_C \leq 30\%$	$M_R \leq 30\%$	$M_T - M_C > 20\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 30\%$ and M_T vs M_C SD ($p \leq 0.05$)
10-day growth	$MIG_C \geq 0.48$ mg/individual	$MIG_R/MIG_C \geq 0.8$	$(MIG_C - MIG_T)/MIG_C > 0.20$ and MIG_T vs MIG_C SD ($p \leq 0.05$)	$(MIG_C - MIG_T)/MIG_C > 0.30$ and MIG_T vs MIG_C SD ($p \leq 0.05$)
20-day mortality	$M_C \leq 32\%$	$M_R \leq 35\%$	$M_T - M_C > 15\%$ and M_T vs M_C SD ($p \leq 0.05$)	$M_T - M_C > 25\%$ and M_T vs M_C SD ($p \leq 0.05$)

Biological Test/ Endpoint*	Performance Standard*		Sediment Cleanup Objective for each biological test	Cleanup Screening Level for each biological test
	Control*	Reference		
20-day growth	$MIG_C > 0.60$ mg/individual	$MIG_R/MIG_C \geq 0.8$	$(MIG_C - MIG_T)/MIG_C > 0.25$ and MIG_T vs MIG_C SD ($p \leq 0.05$)	$(MIG_C - MIG_T)/MIG_C > 0.40$ and MIG_T vs MIG_C SD ($p \leq 0.05$)

Table VII Explanatory Notes:

C = Control;
MIG = Mean individual growth at time final;
SD = Statistically significant difference;
R = Reference;
T = Test.
An exceedance of the sediment cleanup objective and cleanup screening level requires a statistically significant difference at $p \leq 0.05$. Reference performance standards are provided for sites where the department has approved a freshwater reference sediment site(s) and reference results will be substituted for control in comparing test sediments to criteria.
*The department shall use the most updated American Society for Testing and Materials and EPA protocols and performance standards.

Table VIII
Types of Freshwater Sediment Biological Tests, Species, and Applicable Endpoints

Species, Biological Test, and Endpoint	Acute Effects Biological Test	Chronic Effects Biological Test	Lethal Effects Biological Test	Sublethal Effects Biological Test
Amphipod *Hyalella azteca*				
10-day Mortality	x		x	
28-day Mortality		x	x	
28-day Growth		x		x
Midge *Chironomus dilutus*				
10-day Mortality	x		x	
10-day Growth	x			x
20-day Mortality		x	x	
20-day Growth		x		x

Table VIII Explanatory Notes:

The department shall use the most current American Society for Testing and Materials and EPA protocols for establishing appropriate biological tests.

[Statutory Authority: Chapter 70.105D RCW. WSR 13-06-014 (Order 08-07), § 173-204-563, filed 2/25/13, effective 9/1/13.]