Photo Credit: Lower Columbia Solutions Group

Ross Island Fill Evaluation

2022 Ross Island Screening Level Updates

In 2022, Oregon Department of Environmental Quality, or DEQ, updated the Ross Island Sand and Gravel "Class A" in-water screening criteria. These criteria are used to determine whether fill (i.e., soil or sediment) is suitable for unconfined aquatic (i.e., in-water) placement within Ross Island lagoon. Placement of fill within the lagoon is required to meet the reclamation goals for upland and in-water areas that Ross Island Sand and Gravel previously mined. Reclamation of the lagoon is being conducted under permits administered by U.S. Army Corps of Engineers and Oregon Department of State Lands to achieve the objectives of the Ross Island Reclamation Plan. The reclamation goals for upland areas along the lagoon have already been met, therefore this fact sheet is specific to in-water placement of reclamation fill. If placement of upland fill is needed in the future, upland fill testing requirements will generally follow those described below for in-water fill. The updated Ross Island screening levels for in-water fill placement are provided in Table 1. The applicable screening levels for upland fill placement were developed in 2003 and are provided in Table 2. In-water criteria apply to all fill placed in the Ross Island Lagoon below or within 50 feet of the seasonal high-water line. Upland criteria apply to fill placed above this boundary.

Under the Clean Water Act, the interagency Portland Sediment Evaluation Team, or PSET, evaluates the suitability of dredged material for in-water disposal in the state of Oregon using the 2018 Sediment Evaluation Framework for the Pacific Northwest, or SEF. The updated "Class A" in-water screening levels were selected to be protective of human health and the environment. The in-water screening levels and characterization requirements described in this fact sheet are intended to improve clarity and consistency in the fill evaluation process and ensure that in-water disposal decisions to achieve reclamation and remediation goals are based on the best available science. The majority of reclamation fill placed in Ross Island Lagoon is from in-water sources (i.e. dredged material) however fill from an upland source (i.e. soil) is also allowed and follows the same general process for in-water sources, however PSET review is not required.

The purpose of this fact sheet is to provide basic guidance on the sampling and chemical analyses required to characterize material proposed for use as reclamation fill at Ross Island.

In-Water Fill Characterization

In general, procedures for characterizing potential fill from in-water sources (i.e. dredged material) should follow the 2018 SEF. However, the DEQ protocols summarized below occasionally vary from the SEF requirements, and the screening levels consider both sediment toxicity and bioaccumulation potential to assess

the suitability of material proposed for placement in the unique environment of Ross Island Lagoon. DEQ review is required for any project proposing to place fill at Ross Island Lagoon.

Sample Collection

Sampling and testing must be conducted in accordance with a PSET and DEQ-approved Sampling and Analysis Plan (SAP). The SAP must be prepared consistent with the requirements outlined in the SEF and any additional DEQ requirements for material placement in Ross Island lagoon.

The number of samples to be collected and analyzed depends on the nature of the material and potential contamination sources at the project area. Samples must be representative of the fill proposed for placement at Ross Island.

For in-place characterization, the volume of sediment to be dredged should be divided into Dredge Material Management Units, or DMMUs, in accordance with the SEF. DMMU designation should consider prior knowledge of activities that have occurred in the dredge area and the physical nature (e.g., particle size, total organic carbon) of that material. A minimum of three samples must be collected from each DMMU or one sample per 10,000 cubic yards, whichever is greater. The field samples within each DMMU may be composited for analytical testing or analyzed discretely.

Sampling activities should be documented in the field in accordance with the SEF. If free phase product, organic wastes such as wood chips, or other indications of a potential source are observed during sampling, DEQ should be promptly notified and additional testing may be required.

For upland fill sources, a minimum of three samples must be collected per barge load and composited for analysis prior to placement. Requirements for in-place characterization of upland fill sources may vary depending on the source and should be determined through consultation with DEQ.

Sample Analysis

Samples should be analyzed for the freshwater parameters with appropriate method detection limits in accordance with the Ross Island screening levels presented in Table 1 and listed in the SEF. Note Ross Island includes sediment screening levels that consider bioaccumulation potential, and therefore the required detection limits may be lower than the SEF in these cases. Recommended analytical methods and sample quantitation limits are provided in Table 3. Consistent with the SEF, testing for site-specific chemicals of concern may be required if particular sources, activities, or land uses are present or have historically been present in the vicinity of the project site. All chemical analyses should be conducted by an accredited environmental laboratory using accepted methods and must achieve sufficiently low method detection limits for comparison to Table 1. In general, 9 liters of sediment is needed per sample to provide adequate volume for physical, chemical, and bioassay testing. Sediment chemistry typically requires 2 L of sediment, analysis of porewater may require an additional 2 L of sediment, and biological toxicity testing requires a minimum of 5 L of sediment. If required, bioaccumulation testing may require up to an additional 30 L of sediment.

Appropriate Quality Assurance/Quality Control measures should be taken and any results that do not meet data quality requirements should be discussed in the sediment characterization report. A typical QA/QC program includes adherence to laboratory QA/QC procedures, analysis of laboratory QA/QC samples, and collection of field QA/QC samples, as appropriate. For detailed QA/QC requirements see, *Quality Assurance Policy for the Environmental Cleanup Programs* (DEQ 2015).

In-Water Suitability

If chemistry results exceed one or more of the Ross Island screening levels provided in Table 1, they are not acceptable for disposal in-water unless they subsequently pass toxicity bioassay and/or bioaccumulation tests as outlined below. If compounds are detected for which screening levels are not provided in Table 1, it will be necessary to consult with DEQ regarding protective levels and the need for additional testing.

Table 1 is intended to be updated as new information becomes available. These updates may include adding compounds that have been detected in fill proposals or changing screening levels as new toxicity and/or bioaccumulation data become available.

Biological Testing

Biological testing should be performed in general accordance with the SEF and as described below. Sediment from the original sampling may be used for biological testing if sufficient sample volume was collected and is within the 56-day holding time for date of collection. Otherwise, a new sample will need to be collected and analyzed for the exceeding parameter(s), as well as for biological testing. Biological testing must be conducted in accordance with a DEQ and PSET-approved Biological Sampling and Analysis Plan.

If one or more compound exceeds the applicable Ross Island screening level provided in Table 1, toxicity testing may be performed to determine whether the material is suitable for in-water placement. A minimum of two bioassay tests with two different freshwater species will be required before material can be considered for disposal in the lagoon. Bioassay tests must measure growth and mortality biological response endpoints over both short ("acute", 10-day), and long-term ("chronic", 20- or 28-day) exposure durations. The specific bioassay tests and endpoints should be selected in consultation with DEQ. Test results will be evaluated in general accordance with the criteria established in the SEF. DEQ may also consider current ASTM guidance (*Standard Test Method for Measuring the Toxicity of Sediment Associated Contaminants with Freshwater Invertebrates*, ASTM, E1706-20, July 2020) in interpreting bioassay results.

If one or more bioaccumulative compound exceeds the applicable screening level provided in Table 1, a laboratory bioaccumulation test will be required in addition to the bioassay analyses. Bioaccumulation testing requirements are outlined in Section 8.5.2 of the SEF (Standard Bioaccumulation Testing—Freshwater). Results of the bioaccumulation test will be compared to the Acceptable and Critical Tissue Levels provided in DEQ's Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment (DEQ 2007, updated 2020).

For More Information

This fact sheet and additional information about Ross Island and the fill evaluation process can be found on DEQ's website at ordeq.org/ross-island. You can also contact project manager Sarah Greenfield at 503-229-5245 or sarah.greenfield@deq.oregon.gov.

Alternate formats

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.oregon.gov.

Attachments

Table 1 – Ross Island In-water Screening Levels – Updated 2022
Table 2 – Ross Island Upland Screening Levels (4/9/2003)
Table 3 – Recommended Analytical Methods and Reporting Limits

State of Oregon
DEQ Department of Environmental Quality

Table 1 – Ross Island In-Water Screening Levels

Analyte	Ross Island In-Water Screening Level (Updated 2022)
Conventional Parameters	
Total Nitrogen (porewater, mg/L)[a]	–
Total Phosphorous (porewater, mg/L)[a]	–
pH	–
Total Sulfides (mg/kg)	39
Ammonia (mg/kg)	230
Metals (mg/kg)	
Antimony	3
Arsenic[†]	6
Cadmium[†]	0.6
Chromium	37
Copper	36
Lead[†]	17
Mercury[†]	0.07
Nickel	26
Silver	0.57
Zinc	123
Polychlorinated Biphenyls (µg/kg)	
Total PCBs[†,b,c]	9
Pesticides (µg/kg)	
Aldrin	2
Dieldrin[†]	* Detection, MRL of 1
Heptachlor	10
Total Chlordanes[†,b,d]	0.5
Total DDT (DDx)[†,b,e]	3.1
gamma-Hexachlorocyclohexane (Lindane)	5
Polycyclic aromatic hydrocarbons (µg/kg)	
Total PAHs[b,f]	1,610
cPAHs (BaP eq)[b,g]	774
Phthalates (µg/kg)	
Bis(2-ethylhexyl) phthalate	135
Phenols (µg/kg)	
Pentachlorophenol[†]	310
Phenol	120
Butyltins (µg/kg)	
Tributyltin[†]	2.3
Total Petroleum Hydrocarbons (mg/kg)	
TPH-diesel	91
TPH-residual	3,600
Dioxins/Furans (ng/kg)	
2,3,7,8-TCDD eq (TEQ)[†,b]	5.6

Notes

⁻ Testing for this analyte is required, but results will not be used to determine whether the material is suitable for in-water placement.

† This analyte is a bioaccumulative chemical of concern. If the screening level is exceeded, bioaccumulation testing may be performed to determine whether the material is suitable for in-water placement. Bioaccumulation results will be compared to the DEQ acceptable and critical tissue levels (DEQ 2020).

* The lowest applicable screening level is below the MRL, therefore an MRL of 1 must be achieved. The MRL will be used as the screening value.

[a] Total Nitrogen and Total Phosphorus are measured in porewater. Sufficient sediment should be collected for porewater extraction and analysis.

[b] Results for individual chemicals, congeners, and isomers should be reported in the Sediment Characterization Report in addition to the calculated total. For non-detected compounds, both the MDL and the MRL should be reported. Totals should generally be calculated using the non-detect handling rules in Section 6.1.2 of the SEF. Alternative non-detect handling rules may be requested on a project-specific basis.

[c] Total PCBs by 209 congeners is the preferred analytical and summation method for total PCBs. Total PCBs by Aroclors is the summation of Aroclor-1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268.

[d] Total chlordane is the sum of two major compounds (cis-chlordane and trans-chlordane, also known as alpha-chlordane and gamma-chlordane, respectively) and three minor compounds (cis-nonachlor, trans-nonachlor, and oxychlordane).

[e] Total DDT (DDx) is calculated as the sum of the individual DDD, DDE, and DDT isomers including: o,p'-DDD and p,p'-DDD, o,p'-DDE and p,p'-DDE, and o,p'-DDT, p,p'-DDT.

[f] Total PAHs include the sum of 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(ghi)perylene, chrysene, dibenzo(ah)anthracene, fluoranthene, fluorene, indeno(123-cd)pyrene, naphthalene, phenanthrene, pyrene, total benzofluoranthenes (b+k+j).

[g] Total carcinogenic PAHs is the sum of total benzo[a]pyrene equivalent (BAP eq) concentrations of benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene. BAP eq should be calculated using the toxic equivalency factors for carcinogenic PAHs provided in Table 3 of DEQ's Human Health Risk Assessment Guidance (DEQ 2010).

Acronyms and abbreviations

- µg/kg: micrograms per kilogram
- mg/kg: milligrams per kilogram
- mg/L: milligrams per liter
- ng/kg: nanograms per kilogram
- BaP eq: benzo(a)pyrene equivalent
- cPAH: Carcinogenic polycyclic aromatic hydrocarbon
- DDD: Dichlorodiphenyldichloroethane
- DDE: Dichlorodiphenyldichloroethylene
- DDT: Dichlorodiphenyltrichloroethane
- DDx: DDD + DDE + DDT
- MDL: Method detection limit
- MRL: Method reporting limit
- PAH: Polycyclic aromatic hydrocarbon
- PCB: Polychlorinated biphenyl
- SEF: Sediment Evaluation Framework for the Pacific Northwest
- TCDD: Tetrachlorodibenzo-p-dioxin
- TEQ: Toxic equivalency
- TPH: Total petroleum hydrocarbons

References

DEQ. 2020. Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment. Environmental Cleanup Program. October.

DEQ. 2010. Human Health Risk Assessment Guidance. Oregon Department of Environmental Quality, Environmental Cleanup Program. October.

USACE et al. (U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and others). 2018. Sediment Evaluation Framework for the Pacific Northwest. Northwest Regional Sediment Evaluation Team. May.

State of Oregon
DEQ Department of Environmental Quality

TABLE 2

Ross Island Screening Levels - Upland (4/9/03)

Compound	Screening Level (mg/kg)	Basis	Source	AWQC (for comparison to leachate test results) (mg/kg) except where noted	basis
Metals					
Antimony	5	plants	a		
Arsenic	2.12	background	b		
Cadmium	4	plants	a		
Chromium	16	background	b		
Copper	50	invertebrates	a		
Lead	16	birds	a		
Mercury	0.1	invertebrates	a		
Silver	2	plants	a		
Nickel	30	plants	a		
Zinc	53.3	background	b		
Polychlorinated Biphenyls					
Total PCBs	0.22	human (residential)	c		
Pesticides					
DDD	0.01	bird	a		
DDE	0.01	bird	a		
DDT	0.01	bird	a		
Aldrin	0.029	human (residential)	c		
Chlordane	1.6	human (residential)	c		
Dieldrin	0.03	human (residential)	c		
Heptachlor	0.11	human (residential)	c		
Semivolatile Organics					
2-Methylnaphthalene	14.8	RISG RBC - eco	d		
Acenaphthene	20	plants	a		
Acenaphthylene	16	RISG RBC - eco	d		
Anthracene	790	RISG RBC - eco	d		
Benzo(a)anthracene	0.62	human (residential)	c		
Benzo(a)pyrene	0.062	human (residential)	c		
Benzo(g,h,i)perylene	33	RISG RBC - eco	d		
Benzo(k)fluoranthene	6.2	human (residential)	c		
Bis(2-ethylhexyl)phthalate	4.5	birds	a		
Chrysene	62	human (residential)	c		
Dibenzo(a,h)anthracene	0.062	human (residential)	c		
Dibenzofuran	0.002	mammal	a		
Fluoranthene	114	RISG RBC - eco	d		
Fluorene	30	RISG RBC - eco	a		
Indeno(1,2,3-cd)pyrene	0.62	human (residential)	c		
Naphthalene	10	plants	a		
Phenanthrene	6.36	RISG RBC - eco	d		
Phenol	30	invertebrates	a		
Pyrene	68.2	RISG RBC - eco	d		
Organotins					
Tributyltin oxide	18	human (residential)	c		
Tributyltin	21.3	RISG RBC-eco	d	0.000063	fresh chron a
Petroleum					
diesel	100 ppm		e	1 ppm	WQ discharge limits
gasoline	80 ppm		e		

RISG RBC = Ross Island Sand and Gravel Risk Based Concentration developed during remedial investigation
eco = ecological endpoint

a DEQ Ecological Risk Guidance, 2001
b Remedial Investigation/Risk Assessment - Ross Island Sand and Gravel Co.; Landau Associates; 10-21-02; Table 5-23
c. U.S. EPA Region 9 Preliminary Remediation Goals-Residential; www.epa.gov/Region9/waste/sfund/prg/files/02table.pdf
d. Remedial Investigation/Risk Assessment-Ross Island Sand and Gravel Co.; Landau Associates; 10-21-02; Appendix F, Table F-41
e. OAR 340-122-0335

State of Oregon
DEQ Department of Environmental Quality

Table 3 – Analytical Methods and Reporting Limits

Analyte	Sample Preparation Method	Sample Analysis Method	Typical Method Reporting Limit (MRL)[1]
Conventional Parameters			
Total Nitrogen (porewater, mg/L)	[a]	SM 4500-NC	0.05
Total Phosphorous (porewater, mg/L)	[a]	SM 4500-PE	0.01
pH (porewater)	[a]	SM 4500-H	NA
Total Sulfides (mg/kg)	[a]	PSEP 1986/Plumb 1981	1
Ammonia (mg/kg)	[a]	Plumb 1981	0.1
Metals (mg/kg)			
Antimony	EPA 6010/6020/3050B	EPA 6010D/6020B	0.5
Arsenic	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Cadmium	EPA 6010/6020/3050B	EPA 6010D/6020B	0.5
Chromium	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Copper	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Lead	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Mercury	EPA 7471B	EPA 7471B	0.05
Nickel	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Silver	EPA 6010/6020/3050B	EPA 6010D/6020B	0.5
Zinc	EPA 6010/6020/3050B	EPA 6010D/6020B	5
Polychlorinated Biphenyls (µg/kg)			
PCB Aroclors/Congeners[2]	EPA 3540C[b,c]/3550-mod	EPA 8082A/1668C	1-10
Pesticides (µg/kg)			
Aldrin	EPA 3540C/3550-mod	EPA 8081B/1699/SOC-PESTMS2[d]	2
Dieldrin	EPA 3540C/3550-mod	EPA 8081B/1699/SOC-PESTMS2[d]	0.04-2
Heptachlor	EPA 3540C/3550-mod	EPA 8081B/1699/SOC-PESTMS2[d]	0.04-2
Total Chlordanes[3]	EPA 3540C/3550-mod	EPA 8081B/1699/SOC-PESTMS2[d]	0.04-2
DDE (p,p'-,o,p')	EPA 3540C/3550-mod	EPA 8081B	2
DDD (p,p'-,o,p')	EPA 3540C/3550-mod	EPA 8081B	2
DDT (p,p'-,o,p')	EPA 3540C/3550-mod	EPA 8081B	2
gamma-Hexachlorocyclohexane (Lindane)	EPA 3540C/3550-mod	EPA 8081B	2
Polycyclic aromatic hydrocarbons (µg/kg)			
Low molecular weight PAHs			
Naphthalene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Acenaphthylene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20

Acenaphthene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Fluorene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Phenanthrene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Anthracene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
2-Methylnaphthalene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
High-molecular weight PAHs			
Fluoranthene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Pyrene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Benzo(a)anthracene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Chrysene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Benzofluoranthenes	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Benzo(a)pyrene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Indeno(1,2,3-c,d)pyrene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Dibenzo(a,h)anthracene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Benzo(g,h,i)perylene	EPA 3550C-mod[b,e]	EPA 8270D[f]	20
Phthalates (µg/kg)			
Bis(2-ethylhexyl) phthalate	EPA 3550C-mod[b,e]	EPA 8270D[f]	100
Phenols (µg/kg)			
Pentachlorophenol	EPA 3550C-mod[b,e]	EPA 8151/8270D[f]	100
Phenol	EPA 3550C-mod[b,e]	EPA 8151/8270D[f]	20
Butyltins (µg/kg)			
Tributyltin	Krone 1989/DMMP 1998/EPA 8270-SIM	Krone 1989/EPA 8270-SIM	5
Petroleum Hydrocarbons (mg/kg)[4]			
TPH-diesel	EPA 3630C/3665A	NWTPH-Dx	25
TPH-residual	EPA 3630C/3665A	NWTPH-Dx	50
Dioxins/Furans (ng/kg)			
Dioxin/Furan Congeners	EPA 8290A/1613B	EPA 8290A/1613B	1-10

Notes

[1] Typical method reporting limits are provided for informational purposes. MRLs are taken from SEF Table 5-1, where available, and are based on dry sample weight assuming no interferences. Actual MRLs may vary by analytical laboratory and sample matrix. For more information on method detection and reporting limits, refer to Appendix D of Washington Ecology's SCUM (WADOE 2019). All analytical data should report both the MDL and the MRL.

[2] Total PCBs by 209 congeners (EPA 1668C) preferred analytical and summation method for Total PCBs.

[3] Total chlordane is the sum of two major compounds (cis-chlordane and trans-chlordane, also known as alpha-chlordane and gamma-chlordane, respectively) and three minor compounds (cis-nonachlor, trans-nonachlor, and oxychlordane)

[4] NWTPH-Dx includes diesel and residual range hydrocarbons. Because sediments are often comprised of weathered and unresolved petroleum mixtures, it is recommended that TPH be quantified using diesel and motor oil standards (SEF, WADOE).

[a] Sample preparation methods for conventional analyses are described in the analytical methods.

[b] If sulfur is present in the samples, cleanup procedures specified by EPA SW-846 Method 3360B should be used.

[c] All PCB extracts should be subjected to sulfuric acid/permanganate cleanup as specified by EPA SW-846 Method 3665A.

[d] EPA Method 1699 or SOC-PESTMS2 recommended for improving detection limits.

[e] EPA Method 3550 is modified to add matrix spikes before the dehydration step.

[f] Selected ion monitoring may improve the sensitivity of EPA Method 8270 and is recommended for improving detection limits.

Acronyms and abbreviations

- µg/kg: micrograms per kilogram
- mg/kg: milligrams per kilogram
- mg/L: milligrams per liter
- ng/kg: nanograms per kilogram
- DDD: Dichlorodiphenyldichloroethane
- DDE: Dichlorodiphenyldichloroethylene
- DDT: Dichlorodiphenyltrichloroethane
- DMMP: Dredge Material Management Program
- EPA: Environmental Protection Agency
- MDL: Method detection limit
- MRL: Method reporting limit
- PAH: Polycyclic aromatic hydrocarbon
- PCB: Polychlorinated biphenyl
- PSEP: Puget Sound Estuary Program
- SCUM: Sediment Cleanup User's Manual
- SEF: Sediment Evaluation Framework for the Pacific Northwest
- TPH: Total petroleum hydrocarbons
- WADOE: Washington Department of Ecology

References

USACE et al. (U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and others). 2018. Sediment Evaluation Framework for the Pacific Northwest. Northwest Regional Sediment Evaluation Team. May.

WADOE. 2019. Washington Department of Ecology's Sediment Cleanup User's Manual. Publication No. 12-09-057. December.