

# COQUILLE RIVER SEDIMENT EVALUATION, 1996

## ABSTRACT

Sediment from the Federal channel and adjacent boat basin at the mouth of the Coquille River was sampled on 24 June 96. The samples were subjected to physical and chemical analysis under an ongoing sediment quality characterization effort conducted in the Federal channel by the Corps of Engineers. The adjacent Non-Federal commercial and sport boat basin sampling was conducted concurrently by the Environmental Protection Agency with the Corps performing sample collection, testing and reporting on the investigations in support of EPA. Sediment in the Coquille boat basin is predominately dark gray silts and clays containing organics while the sediment from the Federal channel is sand and gravel. Chemical tests were performed only on sediment samples from the boat basin because the sandy, gravelly sediment in the Federal channel meets exclusionary criteria. All sediments tested yielded elevated values for chromium and nickel, yet these values were still below screening levels. Values of mercury, cadmium, silver and lead were below established levels of concern and typical of other coastal marinas. Pesticides and PCB's were not detected in the boat basin. The values for all PAH's were below established concern levels.

## INTRODUCTION

1. Sediment characterization of Coquille River mouth was initially undertaken in 1981 by the Corps in response to a need for determining the suitability of dredged material for in-water disposal. The current study is more comprehensive in scope than previous studies. In addition to physical studies on sediment samples from the Coquille River Federal channel previously performed, this study includes both physical and chemical analysis of sediment samples from the boat basins including the Federal access channel and non-federal portion.

## BACKGROUND

2. The Coquille River enters the Pacific Ocean north of the town of Bandon, Oregon, 226 miles south of the mouth of the Columbia River. The estuary is mainly fed by the Coquille River, which drains 1,058 square miles and is 99.1 miles from its mouth to headwaters.

3. The Federal project starts in deep water and proceeds to RM 1.3 (Figure 1). It is of suitable width and 13 feet deep. Snagging operations to clear the channel are authorized from RM 1.3 to RM 24.

4. Typically, two shoals form in the Federal project; one between the jetty ends at the outlet and the other extends across the channel between RM 0.2 and 0.5. Project sediments are fine to medium sands. Since 1977 the average volume of dredged material has been 59,123 cubic yards (cy), with a range of 2,500 to 115,910 cy placed in the ODMDS each year.

sorted gravely sands to well-sorted fine sands. The volatile solids content at both sites was low with the ODMDS having slightly higher values (0.8 to 2.9%) than the federal project (0.54 to 1.48%). No chemical analysis of Coquille River entrance channel sediments has been done because the material meets exclusionary criteria and there is no reason to believe contamination exists. The material is mostly sand with gravel and there are few heavy industries or other potential sources of contaminants located along the estuary.

6. Sediment samples of the Federal channel taken in 1990 consisted of poorly graded, gravely sands with a mean sand content of 98.6% and fines content of 0.4%. The mean grain size (0.44 mm) indicates the samples were medium sands. The values closely matched those of the 1981 samples, suggesting that the physical properties of the sediment at the Coquille River Federal project have not changed over the years.

7. The purpose of the present study is to provide additional data on the physical character of the sediment in the Federal channel and physical and chemical data on sediments in the Non-Federal boat basin. Additionally, the study will determine whether or not the boat basin sediments are acceptable for inwater disposal. Since there is a greater potential for contaminants to be found in a boat basin with restricted circulation than in the Federal channel, EPA requested the non-federal portion of the boat basin be investigated in this study. Data obtained from those sediments along with the sediment data collected from the Federal project serve to characterize sediment quality from the Coquille estuary. (See Figure 1).

## **METHODS**

8. Nine samples were collected using a Ponar grab sampler which takes a sample about 9 cm thick that represents the surface sediments. These samples were subjected to physical tests including density, void ratio, volatile solids, specific gravity, particle size classification (ASTM D2487) and particle roundness.

9. Samples 1 through 5, taken from the boat basin, were also subjected to chemical analysis. These were collected from the Ponar sampler using acid washed stainless implements and were placed in "clean" jars and transported in ice to the North Pacific Division Laboratory. Sediment samples were cold-stored and shipped to Columbia Analytical Services, NPD's contract laboratory. Sediments were analyzed for the following chemicals of interest:

- total organic carbon (TOC);
- metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn);
- organotins, mono- to tri-n-butyltin (TBT);
- polycyclic aromatic hydrocarbons (PAH);
- polychlorobiphenyls (PCB);
- pesticides.

Chemical analysis tests were run according to standard or modified EPA methods.

## **RESULTS / DISCUSSION**

10. The raw data from the physical and chemical analysis are on file at the Portland District, Corps of Engineers. Sampling locations are shown on Figure 1. The samples requested by the EPA included in this investigation are designated CQR-P-3 through CQR-P-5; samples CQR-P-1, 2, 6-9 are those samples required under the Corps' Federal project monitoring program.

### **PHYSICAL**

11. Results of physical analysis are shown in Table 1. The sediments in the Coquille River, consisting of sands and gravels with the sand fraction having around 60 percent medium-grained sands retained on the 5 to 2.5 mm sieve, tended to be coarser than those from the boat basin. The sediments in the boat basin were silt with an organic content ranging from 6.0 to 8.0 %. The river samples had a mean organic content of 3.4 % which is higher than the value of the 1990 samples (0.8), however the mean is biased by sample CQR-P-6 which had an organic content of 5.9% due to a number of twigs and branches in the sample. One sample from the river, CQR-P-7, taken in the outer channel is not included in the physical analysis since it consisted only of two rock fragments.

12. There is a prominent contrast in the texture and appearance between sediment in the boat basin and that in the river channel. The sediment in the boat basin is a black to brown plastic silt; with the strong odor characteristic of anaerobic digestion processes commonly found in closed basins with little or no circulation.

### **CHEMICAL ANALYSIS**

13. Samples CQR-P-1-5 are from locations outside the Federal channel and will therefore not be included in any Corps dredging operations. Dredging performed in the boat basin would encounter sediments that do not meet exclusionary criteria and would require chemical testing prior to dredging and disposal.

14. Table 2 shows the results of total organic carbon analysis.

15. Selected metals of interest and arsenic occurred in all sediments analyzed (Table 2).

16. Pesticide and PCB results are shown in Table 3. The only chemicals detected in this category were Alpha-BHC (0.2) and 4,4'DDD (0.6) in sample CQR-P-5. Each analyte level is below the laboratory reporting limits of 2 ppb for the compounds, but above the method detection level of 0.2 ppb. There are no previous samples for comparison.

17. All sediment samples analyzed contained PAH's with fluoranthene, pyrene and phenanthrene showing the highest concentration levels in each of the samples (Table 4). Total PAH content of all samples is far below established screening levels for PAH.

18. Organotins were found in four of the five boat basin samples tested. The values listed in Table 3 are estimated, however, since they fall between the method reporting limit of 3 ppb and the method detection level of 0.2 ppb. Tri-n-butyltin, TBT, is the organotin of interest in repair and moorage areas because of its toxicity and also because in the past it was used as an anti-fouling agent.

## **QUALITY CONTROL**

19. Matrix spike and surrogate recoveries were within +/- 40 percent, which is within acceptable quality control limits for all compounds submitted for testing except for metals and AVS. The laboratory's detection limit for mercury was 0.05 ppm and is above the project specified detection limit of 0.02 ppm. The MS recovery of chromium and nickel was below the lower limit of 75%. The laboratory duplicate RPD result of silver was above the EPA QC limit of 35; however, the sample used for spike analysis was a batch sample from Chetco River Boat Basin and should not be considered representative of the Coquille site sample matrix. As a sample from this project was not utilized for QC analysis, the effect of matrix could not be characterized. The laboratory duplicate RPD result of mercury was above QC limits but should not be considered significant for the purpose of data evaluation as the original sample results were within a factor of five to the reporting limit. The AVS MS recovery was below QC limits, however, the sample used for spike analysis was not associated with the project and should not be considered characteristic of the project samples. The effect of the matrix could not be assessed for the project samples. The analytical accuracy is adequate based on an acceptable BS recovery. Analyses were performed in conformance with the quality assurance program of Columbia Analytical Services, Inc. (CAS). Method blank or surrogate recoveries, as applicable to each analytical method are reported in the raw data received from CAS and on file in the Portland District. All EPA recommended holding times were met for analyses of these samples.

## **CONCLUSIONS**

20. The sediments in the boat basins are classified as fine-grained, that is, more than 50 percent of the sediment is silt and, or clay. Fine-grained sediments, including organic silts and especially clay, are of great importance to sediment quality issues because particles of organic compounds and clay carry an electrostatic charge capable of forming electrochemical bonds with a wide range of compounds if they are present.

21. PAH's were found at all sites in the boat basin. All samples analyzed yielded concentrations below established level of concern. Fueling operations, painting or other possible sources of PAH were not observed during the sediment sampling activities. However, considering the fact that commercial and sport fishing activity is likely to remain at about 1996 levels, it is reasonable to assume that PAH concentrations will remain unchanged in the Coquille estuary.

22. Organotins, including TBT were also present in all, but one of the sediments analyzed. The TBT levels were well below the 73 ppb screening level. This investigation found no obvious sources for butyltins. Although there has recently been significant interest in TBT levels in other coastal ports, continued periodic monitoring of the Federal channel here is unlikely to

yield TBT levels that even approach concern levels. However, it would be a prudent management strategy for TBT to be monitored in the future.

## **RECOMMENDATIONS**

23. The Coquille estuary has sediment with low contaminant levels; with contaminants, when present, confined to the commercial boat basin and boat basin entrance area. The material sampled from the Federal channel was well below levels of concern. Additionally, there were no samples from the commercial boat basin that had analysis results that were above levels of concern. This is in general agreement with the findings in 1991 and 1982 at other Oregon coastal estuaries and is to be expected, even though there is continuing commercial activity in the area. However, considering the sediment type in the boat basin and commercial activity in the area, it would be a prudent management strategy to continue periodic monitoring of sediment quality in the Coquille estuary. Since the sediment in the main Federal channel is sand and gravel and no contaminants were found above established levels of concern in any sample, there is no need to undertake further chemical analysis or Tier III biological testing of these sediments. Materials proposed to be dredged from this source are suitable for open-water disposal.

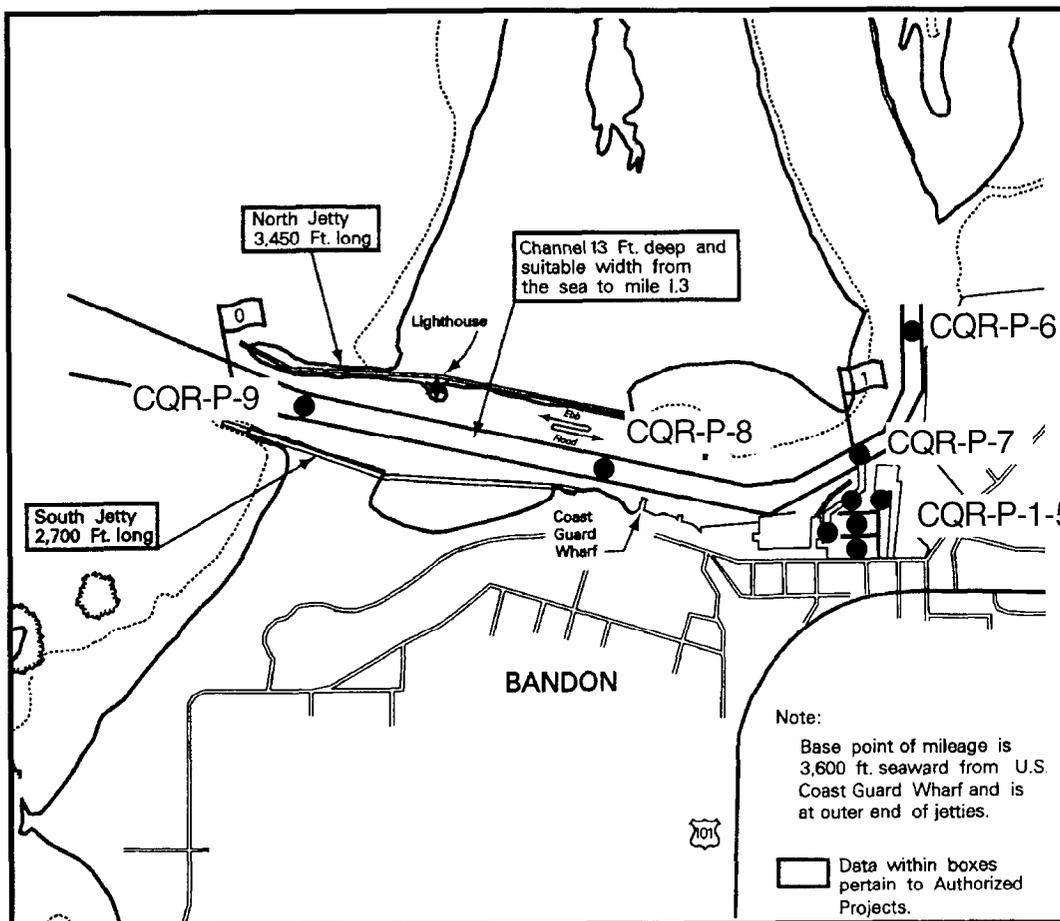


Figure 1: Coquille River Sample Locations, June 1996.

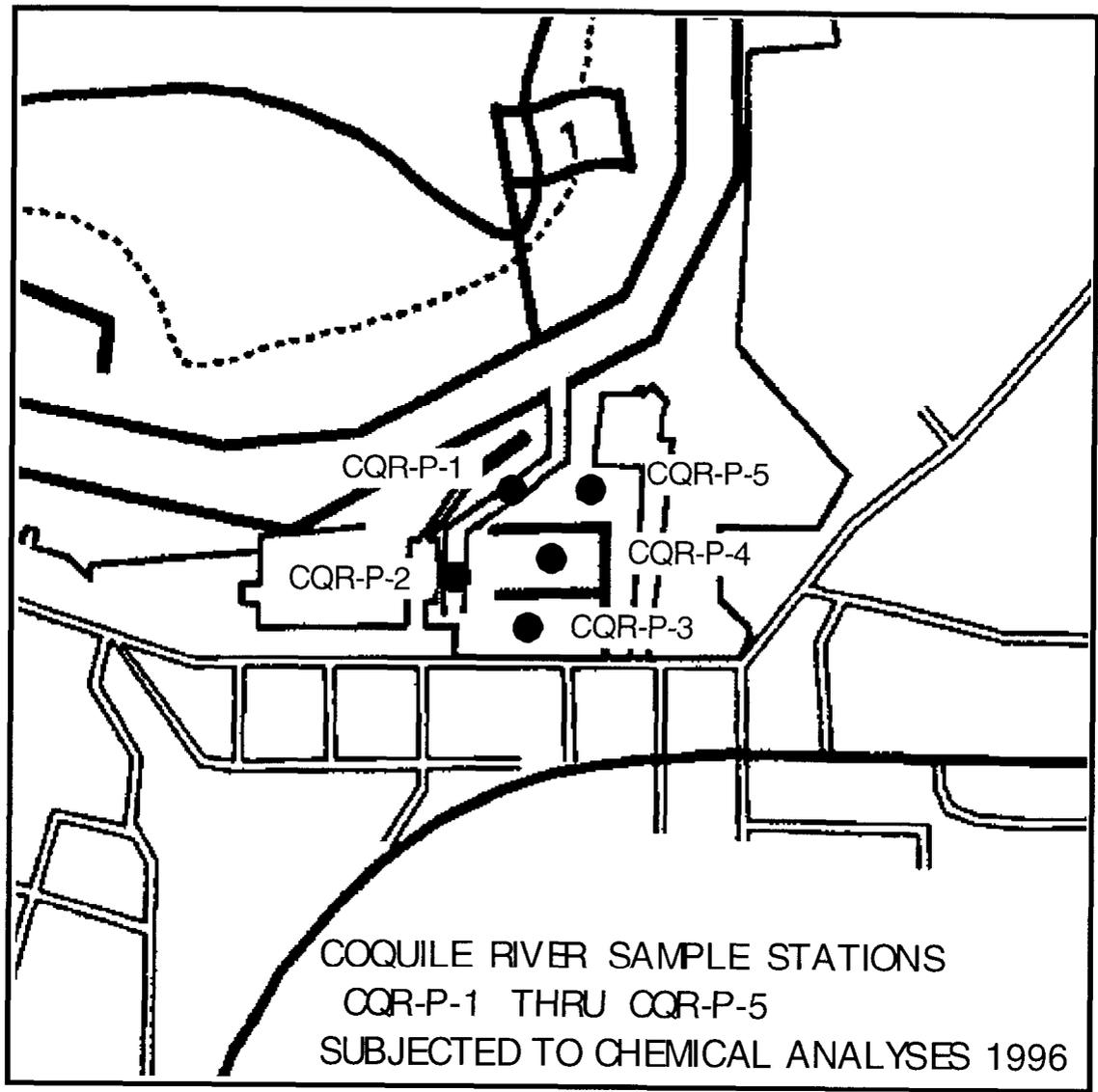


Figure 2: Coquille River Sample Locations, June 1996.

Table 1. Results of physical analyses of the Coquille River sediment samples, 1996

sample	mean gr. size mm	sand	silt	clay %	volatile solids
CQR-P-1	0.023	11.4	75.5	13.1	6.9
CQR-P-2	0.019	5.6	82.2	12.2	7.2
CQR-P-3	0.022	12.8	74.3	12.9	6.0
CQR-P-4	0.027	18.9	67.6	13.5	6.6
CQR-P-5	0.021	5.3	81.6	13.1	8.0
mean	0.022	10.800	76.240	12.960	6.940
CQR-P-6	0.37	95.5	3.1	1.4	5.9
CQR-P-8	0.59	96.8	2.1	1.1	2.9
CQR-P-9	0.33	96.3	2.1	1.6	1.3
mean	0.43	96.20	2.43	1.37	3.37

Table 2. Concentrations of metals, AVS, and TOC in the Coquille River sediments samples, 1996

sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	TOC %	AVS um/g
	ppm										
CQR-P-1	7.0	0.17	89.3	28.1	9.0	0.1	109.0	0.09	64.6	2.27	270
CQR-P-2	8.0	0.18	87.4	28.5	9.0	0.08	108.0	0.08	64.3	2.04	180
CQR-P-3	8.0	0.23	88.5	29.1	9.4	0.07	109.0	0.09	66.4	2.56	460
CQR-P-4	7.0	0.18	83.0	26.5	8.3	0.06	103.0	0.07	60.4	2.47	190
CQR-P-5	8.0	0.27	90.3	28.7	9.5	0.08	107.0	0.09	64.5	2.37	520
mean	7.6	0.2	87.7	28.2	9.0	0.1	107.2	0.1	64.0	2.3	324.0
screening levels	57	0.96	180	81	66	0.21	140	1.2	160		

Table 3. Concentrations of pesticides and PCBs in the Coquille River sediment samples, 1996

sample	Alpha-BHC	4,4'DDE	4,4' DDD	endosulfan II	PCBs	TBT
	ppb					
CQR-P-1	ND	ND	ND	ND	ND	ND
CQR-P-2	ND	ND	ND	ND	ND	0.9
CQR-P-3	ND	ND	ND	ND	ND	0.5
CQR-P-4	ND	ND	ND	ND	ND	0.6
CQR-P-5	0.2	ND	0.6	ND	ND	0.4
mean						0.6

Screening Levels:

Pesticides DDT 15-20  
 PCB's 400-500

Table 4. Concentrations of PAHs and phenols in the Coquille River sediment samples, 1996

sample	naphthalene	2-methyl naphthalene	acenaphthene	dibenzofuran	fluorene	phenanthrene	anthracene	fluoranthene	pyrene	benzo (a) anthracene	chrysene	benzo (b) fluoranthene	benzo (k) fluoranthene	benzo (a) pyrene	indeno (1,2,3-c,d) pyrene	dibenzo (a,h) anthracene	benzo (g,h,i) perylene	total
ppb																		
CQR-P-1	5	11	8	7	9	51	4	61	48	16	20	13	12	10	7	2	10	294
CQR-P-2	6	14	11	8	12	35	13	80	66	19	28	17	16	12	9	2	11	359
CQR-P-3	8	16	20	16	22	129	13	123	90	28	40	28	23	18	15	4	15	608
CQR-P-4	7	16	19	15	17	117	14	127	95	24	40	19	16	13	8	2	8	557
CQR-P-5	7	15	9	10	12	62	9	124	95	24	37	23	20	15	11	3	11	487
mean	7	14	13	11	14	79	11	103	79	22	33	20	17	14	10	3	11	2305

Screening levels: Total PAH's 1500-2000