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STATE OF
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Governor

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M E M O R A N D U M

August 3, 1978

To: John Stetson

From: John Bernhardt

Subject: Grays Harbor Survey

This outlines the Grays Harbor water quality survey we developed for late August, during our 28 July meeting. Please review the following and let me know if you have any additional suggestions or comments.

There are two objectives. First, the survey will provide a quality control check of water quality monitoring ITT Rayonier and Weyerhaeuser have scheduled for the same sampling period. Second, the survey will supplement previous studies conducted on the D.O. sag and, hopefully, help provide a better understanding of the cause or contributing factors.

The survey will be conducted if Chehalis River flows drop below 1,000 cfs and (1) routine monitoring data collected by ITT Rayonier or Weyerhaeuser indicate a D.O. sag is developing while both pulp mills are operating (strike over), or (2) both mills are not operating (on strike).

Jon Neel and Bob Bishop will keep in contact with the pulp mills concerning the status of water quality in the river, check stream flows, etc.

The survey will include the following important aspects:

1. Sampling Stations

Samples will be collected at 18 locations. These will include two point sources, ITT Rayonier and Weyerhaeuser. Sixteen stations will be sampled in the receiving waters, including twelve in Grays Harbor and four rivers; the Chehalis, Wishkah, Hoquiam, and Humptulips:

1. ITT Rayonier
2. Weyerhaeuser
3. Chehalis R. at Montesano
4. Light 11 (71)
5. Light 8
6. Light 6
7. Weyco Mill Site (44)
8. Bay City Dock (45)
9. Standard Oil Dock (47)
10. Wishkah 5 miles above Mouth
11. Railroad Bridge (33)
12. Port Terminal (685)
13. Light 57 (50)
14. Rennie Island (52)
15. Hoquiam R. 5 miles above Mouth
16. Hoquiam Fish Base (53)
17. Humptulips R. 5 miles above Mouth
18. Grays Harbor Mouth

The locations of the sampling stations are shown in Figure 1.

2. Sampling Schedule

Sampling will be conducted Monday, Wednesday, and Friday. Day tides will be sampled as much as possible. The timing will be set to coincide as closely as possible to the sampling conducted by ITT Rayonier and Weyerhaeuser. For the first two runs all stations will be sampled once during high slack tide. The ten harbor stations will be done first to minimize tidal influence at the river stations.

The third run will span a 12-hour tide cycle. The ten harbor stations will be sampled five times during this period:

Run 1	High slack (0 hours)
Run 2	Mid-ebb (+3 hours)
Run 3	Low slack (+6 hours)
Run 4	Mid-flood (+9 hours)
Run 5	High slack (+12 hours)

The remaining stations will be sampled once during this period.

If the results of the tide-cycle sampling do not show a reason to repeat the 12-hour survey, one run will be made at high slack for the remaining runs.

Since it will take 2 to 2½ hours to complete a run, each will begin about 1½ hours before the tide stage shown above. Samplers will begin at the outermost station and work upstream.

Tide tables pertinent to the survey are attached (Figure 2). The overall survey should last about two weeks.

3. Sample Analyses

The sample analyses are shown in Table 1. For the laboratory analyses, TOC's will be run at the Redmond lab. All others will be run at the Tumwater lab.

The field analyses will be taken with standard equipment used by DOE personnel.

In addition to the analyses shown in Table 1, a data set of ten BOD's and ten COD's will be collected during one sampling run in an attempt to correlate TOC levels with BOD loading. Fecal and total coliforms also will be collected during this effort.

4. Equipment

A van will be used to collect the samples at ITT Rayonier and Weyerhaeuser, and the Chehalis, Wishkah, Hoquiam and Humptulip River stations.

The receiving waters will be sampled with ECO-II which will be moored at Breakwater Seafoods on the lower Wishkah River for the duration of the project.

The samples will be collected with standard equipment used by DOE in water quality assessments.

The Water Resources Division of the DOE Southwest Regional Office will be conducting water rights monitoring in the Chehalis Basin during late August. Jon Pace will get flows for the major tributaries of the harbor during our survey. He will require a week's notice. One survey will be enough assuming weather conditions remain stable.

5. Manpower

Four personnel will be required for each sampling run. The Water and Wastewater Monitoring Section will provide two while the remaining two will be provided by the Industrial Section.

Also, the Tumwater Laboratory is operating at full capacity now and expects to remain at this level through August. We will have to provide some assistance, particularly for the tide-cycle sampling run.

6. Comments

We should meet again on about August 16 to finalize our plan and work out any remaining details.

JB:ee

Attachments

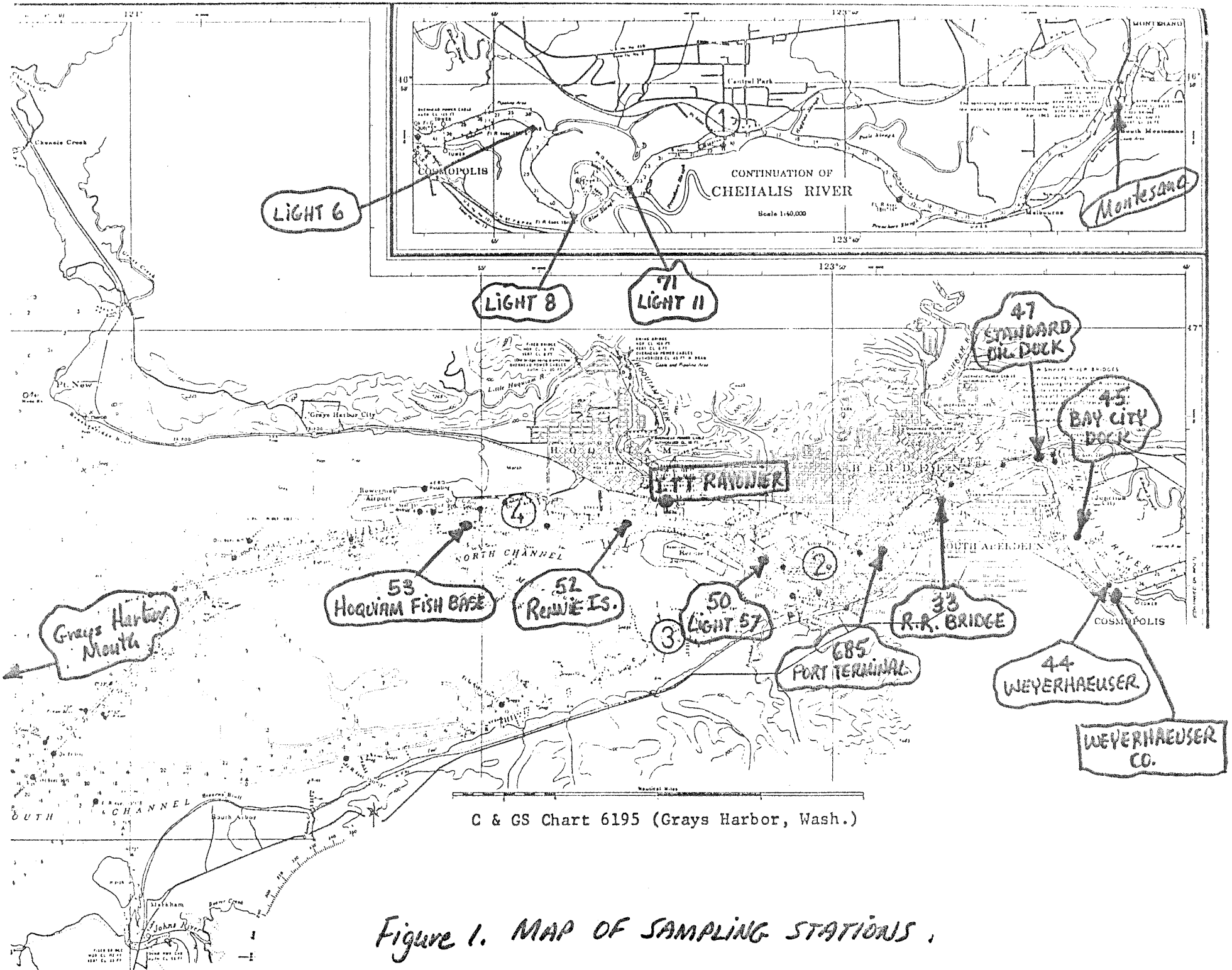
cc: Bill Yake
Dick Cunningham
Roger Stanley
Dan Kruger
Bob Bishop
Jon Neel
Steve Robb

Table 1. Sample Analyses

	Low Slack Sampling		Tide-Cycle Survey	
	Point Sources	Receiving Waters	Point Sources	Receiving Waters
COD	2		2	
BOD_5	2		2	
TSS	2		2	
NVSS	2		2	
TOC	2	28	2	124**
Tannin-Lignin	2	28	2	124
Turbidity	2	28	2	124
Temp*	2	28	2	124
pH*	2	28	2	124
Chlorides	2	28	2	124
PBI	2	28	2	124
Color	2	28	2	124
Conductivity *	2	28	2	124
Salinity*		28		
D.O.*		28		
Secchi*		12		
Flow*	2		2	

* field measurement

** (5 harbor runs) (2 depths X 12 stations) + (4 river stations at 1 run) = 124



C & GS Chart 6195 (Grays Harbor, Wash.)

Figure 1. MAP OF SAMPLING STATIONS.

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

JULY						AUGUST						SEPTEMBER					
DAY	TIME h.m.	HT. ft.	DAY	TIME h.m.	HT. ft.	DAY	TIME h.m.	HT. ft.	DAY	TIME h.m.	HT. ft.	DAY	TIME h.m.	HT. ft.	DAY	TIME h.m.	HT. ft.
1 SA	0428	0.0	16 SU	0354	-0.1	1 TU	0537	-0.3	16 W	0524	-1.1	1 F	0635	-0.2	16 SA	0012	10.5
	1049	7.3		0953	7.3		1208	7.7		1139	8.5		1246	8.8		0640	-0.9
	1623	2.5		1554	2.8		1741	2.6		1738	2.0		1849	1.6		1248	10.4
	2225	9.9		2146	10.4		2330	9.6		2324	10.3					1906	0.0
2 SU	0518	-0.4	17 M	0452	-1.0	2 W	0622	-0.7	17 TH	0616	-1.3	2 SA	0032	9.5	17 SU	0107	10.5
	1145	7.5		1056	7.7		1247	8.0		1231	9.1		0714	-0.2		0726	-0.7
	1716	2.6		1657	2.6		1827	2.4		1831	1.3		1319	9.1		1330	10.6
	2310	9.9		2241	10.7								1931	1.3		1952	-0.4
3 M	0604	-0.8	18 TU	0547	-1.8	3 TH	0012	9.6	18 F	0021	10.3	3 SU	0112	9.5	18 M	0154	10.2
	1234	7.7		1155	8.2		0703	-0.8		0706	-2.0		0751	-0.1		0809	-0.2
	1804	2.5		1753	2.3		1325	8.2		1317	9.7		1350	9.3		1412	10.7
	2352	9.9		2337	11.0		1911	2.2		1923	0.7		2012	1.0		2038	-0.5
4 TU	0646	-1.1	19 W	0638	-2.3	4 F	0051	9.6	19 SA	0115	10.3	4 M	0150	9.3	19 TU	0241	9.8
	1316	7.9		1251	8.7		0742	-0.9		0751	-1.3		0828	0.3		0853	0.4
	1851	2.5		1848	1.8		1357	8.5		1403	10.0		1421	9.5		1449	10.6
							1953	2.0		2013	0.3		2051	0.8		2122	-0.4
5 W	0031	9.8	20 TH	0032	11.1	5 SA	0129	9.5	20 SU	0205	10.5	5 TU	0228	9.1	20 W	0327	9.2
	0727	-1.2		0727	-2.6		0819	-0.7		0837	-1.5		0903	0.7		0935	1.1
	1355	8.0		1343	9.2		1428	8.6		1447	10.2		1453	9.6		1528	10.2
	1934	2.5		1941	1.4		2035	1.9		2100	0.1		2129	0.7		2206	-0.1
6 TH	0109	9.6	21 F	0124	11.0	6 SU	0205	9.2	21 M	0257	9.9	6 W	0309	8.8	21 TH	0416	8.6
	0806	-1.2		0814	-2.6		0855	-0.4		0919	-0.8		0937	1.2		1017	1.9
	1427	8.1		1432	9.5		1500	8.8		1530	10.2		1525	9.7		1608	9.8
	2015	2.5		2030	1.1		2114	1.8		2149	0.1		2211	0.6		2253	0.4
7 F	0145	9.4	22 SA	0218	10.6	7 M	0243	9.0	22 TU	0347	9.2	7 TH	0354	8.4	22 F	0507	8.0
	0844	-1.0		0901	-2.2		0929	0.0		1004	0.6		1014	1.8		1103	2.6
	1502	8.2		1520	9.7		1532	8.9		1611	10.0		1603	9.7		1653	9.4
	2057	2.6		2122	1.0		2155	1.7		2237	0.3		2257	0.6		2343	0.9
8 SA	0221	9.2	23 SU	0312	10.0	8 TU	0323	8.6	23 W	0440	8.5	8 F	0445	8.0	23 SA	0602	7.6
	0921	-0.7		0945	-1.6		1005	0.5		1047	0.9		1053	2.4		1152	3.3
	1534	8.3		1606	9.8		1605	9.1		1656	9.8		1648	9.7		1744	8.9
	2139	2.6		2213	0.9		2237	1.6		2327	0.6		2349	0.7			
9 SU	0259	8.9	24 M	0406	9.3	9 W	0406	8.2	24 TH	0536	7.8	9 SA	0546	7.6	24 SU	0037	1.3
	0958	-0.3		1030	-0.8		1040	1.1		1135	1.8		1145	3.0		0703	7.3
	1608	8.4		1651	9.8		1643	9.2		1741	9.4		1746	9.5		1250	3.7
	2221	2.5		2307	0.9		2323	1.4								1843	8.6
10 M	0339	8.5	25 TU	0503	8.5	10 TH	0459	7.8	25 F	0021	0.9	10 SU	0049	0.7	25 M	0136	1.5
	1035	0.2		1119	0.1		1115	1.7		0633	7.2		0654	7.4		0807	7.3
	1645	8.6		1740	9.7		1725	9.3		1227	2.5		1251	3.4		1353	3.8
	2307	2.4								1833	9.1		1851	9.5		1945	8.4
11 TU	0425	8.1	26 W	0002	1.0	11 F	0015	1.2	26 SA	0118	1.1	11 M	0155	0.5	26 TU	0236	1.6
	1112	0.7		0602	7.8		0600	7.3		0737	6.9		0808	7.5		0906	7.6
	1725	8.8		1203	1.0		1200	2.3		1323	3.1		1407	3.4		1457	3.6
	2354	2.2		1829	9.6		1819	9.4		1928	8.9		2002	9.5		2047	8.5
12 W	0520	7.6	27 TH	0058	1.1	12 SA	0118	1.0	27 SU	0219	1.2	12 TU	0303	0.2	27 W	0335	1.4
	1151	1.3		0708	7.2		0710	7.1		0846	6.9		0916	7.9		1001	8.0
	1811	9.0		1300	1.8		1306	2.8		1425	3.3		1519	3.1		1556	3.1
				1919	9.5		1918	9.6		2027	8.8		2111	9.7		2146	8.7
13 TH	0050	1.9	28 F	0157	1.0	13 SU	0224	0.6	28 M	0319	1.0	13 W	0404	-0.2	28 TH	0428	1.1
	0625	7.2		0813	6.9		0821	7.1		0948	7.1		1020	8.5		1046	8.5
	1239	1.8		1358	2.5		1422	3.1		1525	3.3		1625	2.4		1649	2.5
	1900	9.3		2012	9.4		2022	9.8		2123	8.9		2217	10.0		2239	9.0
14 F	0150	1.4	29 SA	0259	0.8	14 M	0327	0.0	29 TU	0415	0.7	14 TH	0502	-0.6	29 F	0516	0.9
	0734	7.0		0921	6.8		0933	7.3		1044	7.5		1116	9.2		1126	9.1
	1339	2.3		1455	2.8		1533	3.0		1625	3.0		1723	1.5		1739	1.8
	1953	9.6		2103	9.3		2124	10.1		2215	9.1		2316	10.3		2327	9.3
15 SA	0253	0.7	30 SU	0355	0.5	15 TU	0428	-0.7	30 W	0505	0.3	15 F	0553	-0.9	30 SA	0601	0.8
	0845	7.0		1023	7.0		1039	7.9		1129	8.0		1203	9.9		1203	9.5
	1443	2.7		1554	2.9		1638	2.6		1718	2.6		1817	0.7		1823	1.2
	2049	10.0		2154	9.4		2225	10.5		2305	9.3						
			31 M	0450	0.0				31 TH	0553	0.0						
				1118	7.3					1211	8.4						
				1650	2.8					1804	2.1						
				2244	9.5					2353	9.4						

TIME MERIDIAN 120° W. 0000 IS MIDNIGHT. 1200 IS NOON.
HEIGHTS ARE RECKONED FROM THE DATUM OF SOUNDINGS ON CHARTS OF THE LOCALITY WHICH IS MEAN LOWER LOW WATER.