



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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M E M O R A N D U M
November 3, 1983

To: Greg Cloud
From: Dale Norton *D.N.*
Subject: Data on Leachate from the B & L Woodwaste Landfill

During August 22-24, 1983, the Water Quality Investigations Section conducted a survey aimed at determining metals concentrations in Hylebos Creek and its tributaries under low-flow conditions. As part of the investigation, several leachate samples from the B & L Woodwaste Landfill were collected and analyzed for metals (EPA Region X, Manchester Laboratory) and conventional pollutants (WDOE Tumwater Laboratory). These data, as well as the data you collected on January 19 and May 20, 1982, have been summarized in Table 1. Sampling locations are shown in Figure 1.

High concentrations of arsenic (up to 26.9 ppm) were detected in all B & L Landfill leachate samples. These samples represent some of the highest arsenic concentrations found in discharges to Commencement Bay and adjacent areas. Concentrations of several other metals including antimony, lead, nickel, and zinc were also several times higher in B & L leachate samples than in Surprise Lake ditch and Hylebos Creek which receive this discharge. Arsenic was not detected in water samples from Surprise Lake ditch above its confluence with the B & L ditch. Water samples from the mouth of Surprise Lake ditch, however, showed a substantial increase in arsenic concentrations. Other metals did not appear to be elevated as a result of the B & L discharge.

Arsenic loads from the B & L landfill and Surprise Lake ditch are summarized in Table 2. A dilution ratio of approximately 60:1 would be required to bring the arsenic concentration in the B & L leachate to a level below EPA's criterion (440 µg/L) for the protection of aquatic life. Under the low-flow regime of August 1983, a dilution ratio of approximately 80:1 existed at the point where water from the B & L ditch and the Surprise Lake ditch are completely mixed.

Data on metals concentrations in sediments from Hylebos Creek and Surprise Lake ditch are presented in Table 3. Sediments from the mouth of Surprise Lake ditch contained arsenic concentrations (150 mg/Kg) five to

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six times higher than any other sediment sample collected during our survey, with the exception of one estuary sample (60 mg/Kg) collected on August 24, 1983 from the mouth of Hylebos Creek which may be affected by the use of ASARCO slag near this site. Since our sediment data only represent a single observation, we have recently collected additional samples to confirm our previous results. I will forward the data to you as soon as I receive them from EPA's Manchester laboratory.

Based on the above results, it appears that the B & L Woodwaste Landfill continues to be a major source of arsenic to Surprise Lake ditch and Hylebos Creek.

The conventional water quality data in Table 4 on B & L leachate, water from Surprise Lake ditch, and Hylebos Creek show that specific conductivity, turbidity, TSS, COD, color, and tannins were much higher in the B & L leachate compared to water from Surprise Lake ditch and Hylebos Creek. While dissolved oxygen was not measured in Surprise Lake ditch, there is the potential for dissolved oxygen problems in Surprise Lake ditch due to B & L leachate.

Between October 18 and 22, 1983, a 96-hour static acute toxicity bioassay was performed by WDOE on leachate from the B & L landfill using Coho salmon (*Oncorhynchus kisutch*) as the test organism. The results of this test were as follows:

<u>Percent Leachate by Volume</u>	<u>Percent Mortality</u>
100	100
50	43
10	3
1	0
Control	0

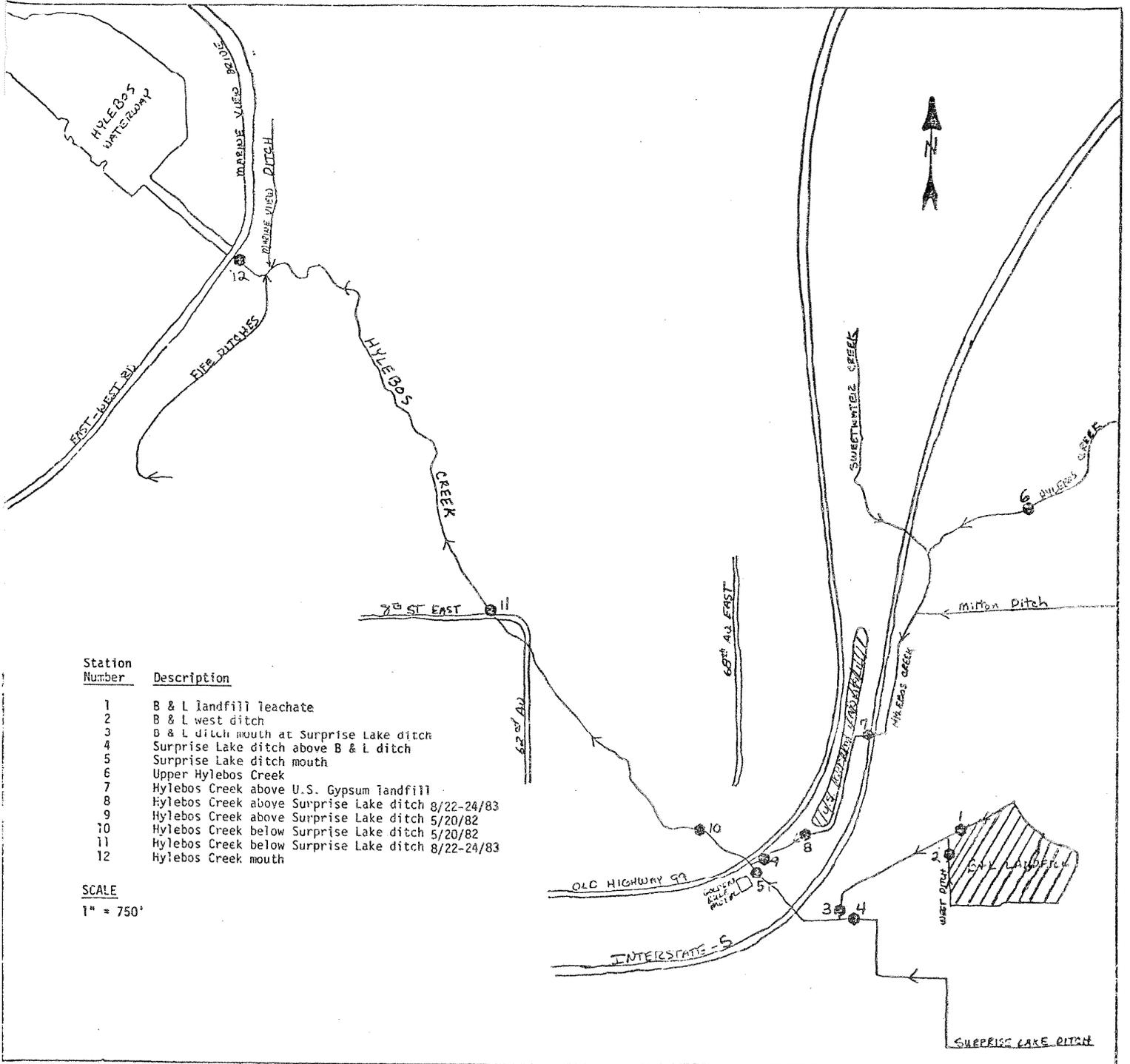
Several metals samples were collected in conjunction with the bioassay to characterize both the initial and final metals concentrations in each of the dilutions. I will forward these data to you as soon as I receive them from EPA, Manchester.

Additional studies will be conducted during wet weather this winter on Hylebos Creek, Surprise Lake ditch, and the B & L landfill. We will continue to keep you informed on the results of these studies.

DN:cp

Attachments

cc: Art Johnson
Jim Krull
Bill Yake



Station Number	Description
1	B & L landfill leachate
2	B & L west ditch
3	B & L ditch mouth at Surprise Lake ditch
4	Surprise Lake ditch above B & L ditch
5	Surprise Lake ditch mouth
6	Upper Hylebos Creek
7	Hylebos Creek above U.S. Gypsum landfill
8	Hylebos Creek above Surprise Lake ditch 8/22-24/83
9	Hylebos Creek above Surprise Lake ditch 5/20/82
10	Hylebos Creek below Surprise Lake ditch 5/20/82
11	Hylebos Creek below Surprise Lake ditch 8/22-24/83
12	Hylebos Creek mouth

SCALE
1" = 750'

Figure 1. WDOE station locations, B & L landfill, Surprise Lake ditch, and Hylebos Creek.

Table 1. WDOE data on metals concentrations in leachate from B & L landfill and water from Surprise Lake ditch and Hylebos Creek, Milton, WA ($\mu\text{g/L}$ total metal in unfiltered samples).

Station Number and Description	Date Collected	Time	Flow (cfs)	As	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Zn
1. B & L landfill leachate	1/19/82	--	--	10,000	--	--	<10	--	<20	<20	--	390
	5/20/82	--	--	6,100	--	--	<10	--	<20	<20	23	220
	8/22/83	0950	.003	26,900	.8	<1	93	<.06	166	115	53	673
	8/24/83	1020	.003	25,900	.7	<1	54	<.06	98	6	39	421
2. B & L landfill west ditch	5/20/83	--	--	200	--	--	<10	--	<20	<20	<5	26
3. B & L landfill ditch mouth @ Surprise Lk. Ditch	8/20/83	1005	--	5,400	.1	<1	14	<.06	21	20	4	131
4. Surprise Lk. ditch abv B & L landfill	5/20/82	--	--	<4	--	--	<10	--	<20	<20	<5	<5
	8/22/83	1000	.25	<1	.1	<1	27	<.06	<1	16	<1	24
5. Surprise Lk. ditch mouth	5/20/82	--	--	300	--	--	<10	--	<20	<20	<5	7
	8/22/83	1030	--	110	.1	<1	23	<.06	6	11	2	<1
	8/24/83	1020	.28	140	.2	<1	17	<.06	1	13	3	10
	8/22-24/83	Comp.	.3(.28-.32) ^{2*}	158	.1	<1	30	<.06	<1	13	2	13
8. Hylebos Cr. abv Surprise Lk. ditch	8/22-24/83	--	6.3	4(2-5) ^{3*}	.2	<1	1	<.06	1	11	4	9
9. Hylebos Cr. abv Surprise Lk. ditch	5/20/82	--	--	<4	--	--	<10	--	<20	<20	<5	<5
10. Hylebos Cr. blw Surprise Lk. ditch	5/20/82	--	--	38	--	--	<10	--	<20	<20	<5	<5
11. Hylebos Cr. blw Surprise Lk. ditch	8/22-24/83	--	6.5(6.4-6.8) ^{3*}	<1(all<1) ^{5*}	<.2(<.1-.5) ^{5*}	<4(<1-6) ^{5*}	12(5-18) ^{5*}	<.06(<.06-.07) ^{5*}	<2(<1-7) ^{5*}	10(8-12) ^{5*}	<1(<1-2) ^{5*}	9(3-17) ^{5*}
EPA Freshwater Criteria	Maximum			440	3.0**	4,700**	22**	6.1	1,800	170	--	320
	24-hour average			--	.025**	--	5.6	.2	96	3.8	--	47
	Acute			--	--	--	--	--	--	--	9,000	--
	Chronic			--	--	--	--	--	--	--	1,600	<5

*mean(range) number of samples

**Based on a total hardness of 100 mg/L as CaCO_3 .

Comp. = Composite of five, one-quart aliquots.

Table 2. Arsenic loads from B & L landfill and Surprise Lake ditch based on WDOE data collected 8/22-24/83.

Station Number and Description	Date Collected	Time	Flow (cfs)	Concentration ($\mu\text{g/L}$)	Load (lbs/day)
1. B & L landfill leachate	8/22/83	0950	.003	26,900	.43
" " " "	8/24/83	1020	.003	25,900	.42
4. Surprise Lk. ditch abv B & L landfill	8/22/83	1000	.25	<1	<.0013
5. Surprise Lk. ditch mouth	8/24/83	1020	.28	140	.21
" " " "	8/22-24/83	Comp	.3	158	.26

Comp. = Composite of five, one-quart aliquots.

Table 3. WDOE data on metals concentrations in sediments* from Surprise Lake ditch and Hylebos Creek (mg/Kg dry weight).

Station Number and Description	Date Collected	As	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Zn
5. Surprise Lk. ditch mouth	8/23/83	150	.36	12	143	.008	11	13	<.1	56
6. Upper Hylebos Cr.	8/23/83	21	.11	17	112	.005	25	6	.4	42
7. Hylebos Cr. abv U.S. Gypsum landfill	8/23/83	3	.15	16	90	<.003	25	8	<.1	48
8. Hylebos Cr. abv Surprise Lk. ditch	8/23/83	24	.12	13	82	.003	22	5	<.1	43
11. Hylebos Cr. blw Surprise Lk. ditch	8/23/83	32	.17	14	87	.078	18	5	.1	53
12. Hylebos Cr. mouth	8/23/83	23	.11	13	125	.016	17	6	.1	45
" " "	8/24/83	60	.26	14	341	.028	12	20	.4	78

*Top 2 cm of surface sediment.

Table 4. MDOE data on conventional water quality parameters in leachate from B & L landfill and water from Surprise Lake ditch and Hylebos Creek, Milton, WA (all samples grab).

Station Number and Description	Date Collected	Time	Flow (cfs)	pH (S.U.)	Turbidity (NTU)	Conductivity (µmhos/cm)	DO (mg/L)	TSS (mg/L)	Color (S.U.)	Total Hardness as CaCO ₃ (mg/L)	Tannin (mg/L)	Fecal Coll. (#/100 mL)	NO ₃ -N (mg/L)	NO ₂ -N (mg/L)	NH ₃ -N (mg/L)	T-PO ₄ -P (mg/L)
1. B & L landfill leachate	1/19/82	--	--	6.1	--	949	1.40C	--	3,200	--	53	--	--	--	--	--
	5/20/83	--	--	6.3	--	630	540	71	2,100	--	10	--	+.25	+.25	1.3	.31
	8/22/83	0950	.003	8.2	120	1,340	670	490	680	--	52	67 est.	-.05	+.05	2.1	.50
2. B & L landfill west ditch	5/20/82	--	--	8.6	--	377	160	55	1,200	--	47	--	+.05	+.05	.55	.14
3. Surprise Lk. ditch abv B & L landfill	5/20/82	--	--	7.8	--	226	8	9	50	--	1	--	.84	.02	.08	.14
4. Surprise Lk. ditch mouth	5/20/82	--	--	7.7	--	253	54	18	180	--	3	--	.75	.02	.2	.27
5. Upper Hylebos Cr.	8/22-24/83	--	.79(.77-.8) ³⁰	7.5(7.5-7.8) ³⁰	(2-3) ³⁰	175(159-194) ³⁰	--	3(1-7) ³⁰	--	78(73-81) ³⁰	--	117(430-1100) ³⁰	1.1(1.06-1.1) ³⁰	.02(.01-.02) ³⁰	.02(.02-.03) ³⁰	.04(.03-.04) ³⁰
9. Hylebos Cr. abv Surprise Lk. ditch	5/20/82	--	--	7.6	--	171	12	6	42	--	1	--	.58	.01	.04	.07
10. Hylebos Cr. b/w Surprise Lk. ditch	5/20/82	--	--	7.5	--	180	12	0	50	--	1	--	.58	.02	.07	.11
11. Hylebos Cr. b/w Surprise Lk. ditch	8/22-24/83	--	1.5(6.4-8.8) ³⁰	7.6(7.5-7.8) ³⁰	10(9-10) ³⁰	194(177-214) ³⁰	--	16(10-19) ³⁰	--	84(81-85) ³⁰	--	180(430-770) ³⁰	.68(.65-.70) ³⁰	.01(.01-.02) ³⁰	.07(.07-.08) ³⁰	.1(.08-.11) ³⁰

mean(range)number of samples³⁰

est. = estimated (non-ideal) count