

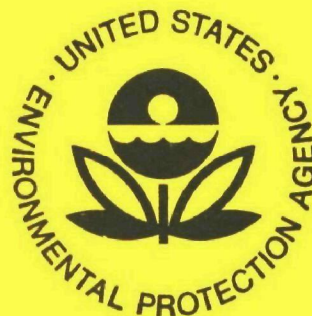
WALLOOMSAC RIVER STUDY

1977

REPORT OF DATA

**United States
Environmental
Protection Agency

Region I**



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1977

REPORT OF DATA

by

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- I TIME OF TRAVEL STUDY
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Abbreviations Used In The Report

<u>Abbreviation</u>	<u>Description</u>	<u>Units of Measure</u>
Temp	Temperature of sample	Degrees centigrade, °C
DO	dissolved oxygen	milligrams per liter mg/l
MGD	million gallons per day	million gallons per day
CFS	cubic feet per second	cubic feet per second
CMS	cubic meters per second	cubic meters per second
TNFR	total nonfilterable residue (total suspended solids)	mg/l
BOD	biochemical oxygen demand incu- bated at 20°C	mg/l
BOD ₅	BOD after five days	mg/l
BOD _u	calculated ultimate BOD	mg/l
NH ₃	ammonia nitrogen	mg/l as nitrogen (N)
NO ₂ -NO ₃	combined nitrite-nitrate nitrogen	mg/l as N
TKN	combined organic and ammonia nitrogen	mg/l as N
Chlor <u>a</u>	chlorophyll <u>a</u> concentration determined fluorometrically	micrograms/liter (ug/l)
Pheo <u>a</u>	pheophytin <u>a</u> determined fluorometrically	ug/l

Symbols preceding a report value denote the following:

- J = approximate value not accurate
- K = less than
- R = results not reported
- = no sample collected

WALLOOMSAC RIVER STUDY

1977

OVERVIEW

The State of Vermont Agency of Environmental Conservation (AEC) requested assistance of the U. S. Environmental Protection Agency's (EPA), Region I, Surveillance & Analysis Division (S&A) and Systems Analysis Branch (SAB) in modeling a portion of the Walloomsac River from Bennington, VT to just above its confluence with the Hoosic River. The modeling effort was divided among the three participants as follows:

1. AEC - Provide time of travel information at two flow regimes and cross sectional data.
2. S&A - Provide 3 days of ambient and source water quality data.
3. SAB - Provide modeling capabilities based on information obtained by the AEC and S&A.

S&A was subsequently asked by SAB to collect additional time of travel and hydrology information.

With the exception of chlorophyll a and pheophytin a results, all data requested of S&A has been sent piecemeal to the AEC and SAB. This report is intended to summarize all the data under one cover including the chlorophyll a and pheophytin a results.

GENERAL

From August 23, 1977 to August 26, 1977, S&A personnel conducted a water quality and major discharge study on the Walloomsac River from just below the confluence with Roaring Branch in Bennington, VT to the Route 22 bridge in North Hoosick, NY. The sample station locations are shown and described in Figure 1 and Table 1 respectively.

On November 10, 1977, S&A personnel conducted a time of travel study from the dam just above the Henry Covered Bridge in Bennington, VT to the Columbia Corporation Dam in Walloomsac, NY.

AMBIENT WATER STUDY

S&A personnel collected ambient water samples from eleven locations: nine on the main stem of the Walloomsac River and two on major tributaries. Samples collected from two of the stations on the main stem were analyzed for dissolved oxygen only, while water samples collected from the tributaries and other main stem stations were analyzed for the parameters shown in Table 2. The number and types of samples collected at each ambient station are also shown in Table 2.

The ambient sampling was split into three 8 hour crews. Each crew made one sample run to record water temperature and collect the necessary samples to perform the types of analyses presented in Table 2 and one run for water temperature and dissolved oxygen information only. Composite samples consisted of equal aliquots of sample from the first daily run of each crew. These composites then represented a 24 hour composite made up of three samples collected at approximately 8 hour intervals.

Ambient water results are presented in Table 3. Long term BOD results are presented in Table 4.

In addition to the sampling effort, temperature - dissolved oxygen recorders were set up at three locations during the study. Table 5 indicates the recorder locations and lists the results.

Flows during the study period were obtained from the U.S. Geological Survey gage located at river mile 9.99 (kilometer 16.08) approximately 0.02 miles (0.03 kilometers) downstream from the Henry Covered Bridge. These flows are given in Table 6.

MAJOR WASTEWATER DISCHARGES

Most of the major discharges in Vermont having access to the Walloomsac River and its tributaries discharge into the Bennington Wastewater Treatment Facility (WWTF). The only other major Vermont discharger is Fairdale Farms, Inc. which discharges its treated wastewater to an unnamed tributary which joins the Walloomsac River just above the Bennington, VT WWTF discharge. Columbia Corporation, a paper company discharging treated wastewater into the Walloomsac River in Walloomsac N.Y. was also sampled.

Wastewater sampling consisted of using automatic samplers to collect 24 hour composite samples. In several instances, the samplers malfunctioned and grab samples were collected. Table 7 lists the results of the wastewater sampling effort and indicates whether the sample was a 24 hour composite or grab. Table 8 lists WWTF flows.

TIME OF TRAVEL AND OTHER HYDROLOGICAL INFORMATION

To supplement data provided by the AEC, S&A conducted one time

of travel study on November 10, 1977 from the dam just above the Henry Covered Bridge in Bennington, VT to the Columbia Corporation Dam. The results of this study is attached as Appendix I. On November 9, one cross section was determined and notes made relative to the physical appearance of the river seen by car from Paran Creek in Bennington, VT to the Columbia Corporation Dam. This information is included as Appendix II.

TABLE 1
WATER QUALITY STATION LOCATIONS

<u>River Stations</u>	<u>River Mile/Kilometer</u>	<u>Location</u>
WR01	13.91/22.38	Footbridge between Mt. Anthony Country Club and the intersection of Hicks Ave. and Prichard Rd., downstream of small dam
WR02	11.07/17.81	Covered bridge upstream of Vermont Tissue
WR03	10.45/16.81-0.06/0.10	Footbridge at Paran Creek, parallel to Rte. 67A
WR4A	10.02/16.13	Dam just above Henry Covered Bridge
WR04	10.01/16.11	Henry Covered Bridge between Orebed Rd. and Harrington Rd., downstream of small dam
WR12	9.97/16.04-0.03/0.05	Creek (Fairdale Farms outfall) off Orebed Rd., 0.04 mi/0.07km. downstream of WR04
WR06	7.75/12.47	Off Harrington Rd., 0.19 mi/0.31 km. from the intersection with Rte. 67
WR07	6.22/10.01	First bridge off Rte. 67 on the N.Y. side
WR7A	5.83/9.38	Abandoned RR bridge, 0.39 mi/0.63 km downstream of WR07
WR08	5.13/8.25	Bridge 0.7 mi/1.13 km downstream of WR7A
WR09	3.19/5.13	Dam 0.15 mi/0.24 km upstream of bridge at Columbia Paper, Walloomsac, NY
WR9A	3.04/4.89	First bridge downstream of Columbia Paper, Walloomsac, NY
WR11A	1.69/2.72	Dam immediately upstream of Flomatic Valve Co., Hoosick Falls, NY
WR11	1.50/2.41	Lower bridge (parallel to Rte. 22) 0.19 mi/0.31 km downstream of Flomatic Valve Co., Hoosick Falls, NY

TABLE 2
NUMBERS AND TYPES OF SAMPLES COLLECTED

STATION	GRAB SAMPLES				COMPOSITE SAMPLES					
	TEMP.	DO	CHLOR <u>a</u>	PHEO <u>a</u>	BOD ₅	BOD _u	TNFR	TKN	NH ₃ -N	NO ₂ -NO ₃
WR01	18	18	6	6	3	0	0	0	6*	6*
WR02	18	18	6	6	3	0	0	0	6*	6*
WR03	18	18	6	6	3	0	0	0	6*	6*
WR04	18	18	6	6	3	3	0	0	6*	6*
WR04A	4	5	0	0	0	0	0	0	0	0
WR06	18	18	6	6	3	0	0	0	6*	6*
WR07	18	18	6	6	3	3	0	0	6*	6*
WR07A	13	13	0	0	0	0	0	0	0	0
WR08	18	18	6	6	3	0	0	0	6*	6*
WR09	18	18	6	6	3	3	0	0	6*	6*
WR09A	18	18	0	0	0	0	0	0	0	0
WR11A	16	16	0	0	0	0	0	0	0	0
WR11	18	18	6	6	3	3	0	0	6*	6*
WR12	18	18	3	3	3	3	0	0	5**	5**
BENN02	1	2	0	0	3	3	3	3	3	3
FAFA01	2	2	0	0	3***	3***	3***	3***	3***	3***
COLU01	1	2	0	0	3	3	0	3***	3***	3***

* Includes 3 grab samples

** Includes 2 grab samples

*** Includes -1 grab sample

TABLE 3
AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR <u>a</u> (ug/l)	PHEO <u>a</u> (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR01	08/23	0810	14	9.8		K0.05	0.23	1.55	1.22
		1157	16	9.5				1.46	1.10
		1620	18	8.9					
		2000	18	8.6					
	08/24	0000	16	8.8	K1	K0.05	0.25		
		0335	15	9.0					
	08/23-24	9999							
	08/24	0820	15	9.4				1.20	1.57
		1221	15	9.2				2.28	1.72
		1615	15	9.4					
		2000	14	9.7					
	08/25	0000	14	9.3	1	K0.05	0.32		
		0350	14	9.3					
	08/24-25	9999							
	08/25	0807	12	9.6				0.86	1.06
		1200	15	9.5				1.68	1.31
		1645	16	9.2					
		2010	15	9.0					
	08/26 08/25-26	2350	14	9.2	1	K0.05 K0.05	0.28 0.28		
		0335	13	9.4					
		9999							

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR <u>a</u> (ug/l)	PHEO <u>a</u> (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR02	08/23	0815	14	9.2		K0.05	0.27	0.53	0.98
		1206	16	10.1				0.69	0.91
		1635	18	10.0					
		2010	18	9.4					
	08/24	0005	17	8.2	1	K0.05	0.25		
		0340	15	8.4					
	08/23-24	9999							
		0827	15	8.6				1.29	1.48
		1229	15	9.0				1.20	1.14
		1645	15	9.5		K0.05	0.29		
	08/25	2020	15	9.0					
		0005	14	8.8	K1	K0.05	0.30		
	08/24-25	0355	14	9.2					
		9999							
	08/25	0815	13	8.9				0.94	1.13
		1208	14	9.8				0.99	1.14
		1655	17	10.1					
		2020	17	9.7					
	08/26	2355	15	8.7	1	K0.05	0.28		
		0340	14	8.8					
	08/25-26	9999				K0.05	0.30		
WR04	08/23	0828	15	9.5		K0.05	0.24	1.12	2.08
		1216	16	10.0				1.55	1.22

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)	
						NH ₃	NO ₂ -NO ₃			
WR04	08/23	1710	18	9.3	J2	K0.05	0.20	1.63 1.72	2.10 1.64	
		2030	18 °	8.5						
	08/24	0015	17	8.6						
		0355	16	8.6						
	08/23-24	9999								
		08/24	0836	16						9.0
	1237		16	9.4						
	08/25	1710	16	9.3						
		2035	16	9.2						
	08/24-25	0015	14	9.2						
		0400	15	9.1						
	08/25	0825	13	9.7						
		1217	15	9.6						
	08/26	1715	17	J10.0						
		2035	17	9.1						
	08/25-26	0005	16	8.9						
		0350	14	9.0						
	WR4A	08/25	1222	14	10.4	1	K0.05 K0.05	0.22 0.27		
			1715	17	J9.9					
08/26		2030	17	9.0						
		0008	15	9.0						
		0350		9.0						

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR <u>a</u> (ug/l)	PHEO <u>a</u> (ug/l)
						NH ₃	NO ₂ -NO ₃		
WRO6	08/23	0843	15	9.0		0.40	0.31	1.59	1.55
		1228	17	10.8				2.92	2.19
		1735	18	9.8					
		2040	17	7.6					
	08/24	0030	18	6.7					
		0410	16	7.0					
	08/24-25	9999			2	0.40	0.32		
	08/24	0849	16	8.2		0.90	0.40	2.41	2.28
		1248	16	8.2				2.75	2.10
		1735	16	8.4					
		2050	16	7.8					
	08/25	0030	15	7.5					
		0415	14	8.2					
	08/24-25	9999			3	0.55	0.35		
	08/25	0838	13	9.0				2.58	2.43
		1233	15	10.1				2.84	2.01
		1740	17	10.6					
		2050	16	7.8					
	08/26	0020	15	7.1		0.35	0.31		
		0410	14	7.3					
	08/25-26	9999			3	0.45	0.37		
WRO7	08/23	0850	15	8.4		0.20	0.32	1.72	1.69
		1234	17	11.1				3.44	3.17

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR07	08/23	1805	18	9.3	3	0.40	0.37	2.58 4.21	2.32 3.14
		2055	17	7.5					
	08/24	0035	17	6.5					
		0415	16	6.8					
	08/23-24	9999							
		08/24	0855	16					
	1253		16	9.1					
		1755	16	8.7					
		2100	16	7.9					
	08/25	0035	14	7.1					
		0420	14	7.6					
	08/24-25	9999							
		08/25	0846	14					
	1238		15	10.7					
		1750	18	10.1					
		2100	16.5	7.9					
08/26	0025	15	7.0						
	0415	14	6.9						
08/25-26	9999								
	WR07A	08/24	0130	16	6.3				
0500			16	6.4					
1345			15	9.1					
1900			16	8.2					
2215			16	7.4					

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR07A	08/25	0120	15	7.0					
		0502	14	7.3					
		0936	14	9.2					
		1245	15	9.0					
		1845	18	9.5					
	08/26	2150	16	7.6					
		0030	15	7.0					
		0420	14	7.2					
WR08	08/23	0855	16	8.9				3.27	2.49
		1240	17	11.2		0.10	0.32	2.84	1.64
		1830	18	9.6					
		2105	18	7.8					
	08/24	0045	16	6.5					
		0420	16	6.4					
	08/23-24	9999			2	0.30	0.40		
	08/24	0901	16	7.2				3.01	2.32
		1259	16	8.6				2.36	2.01
		1805	16	8.7		0.50	0.54		
		2115	16	7.7					
	08/25	0040	15	7.2					
		0425	15	7.4					
	08/24-25	9999			3	0.40	0.47		
	08/25	0852	14	6.9				2.95	3.29
		1250	15	11.2				4.94	3.32

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR08	08/25	1800	18	10.4	3	0.30	0.44		
		2110	16	8.2					
	08/26	0038	15	6.9					
		0425	14	7.0					
	08/25-26	9999				0.30	0.46		
WR09	08/23	0903	16	6.9		0.09	0.35	3.61	3.42
		1247	17	11.1					
		1845	18	10.0					
		2110	18	8.0					
	08/24	0050	17	6.4	2	0.20	0.42		
		0430	16	6.2					
	08/23-24	9999							
	08/24	0908	17	6.8		0.15	0.43	6.45	4.21
		1306	16	8.5					
		1820	16	9.9					
		2125	16	7.9					
	08/25	0050	15	7.2	3	0.35	0.49		
		0432	15	7.0					
	08/24-25	9999							
	08/25	0859	14	7.8				6.45	5.28
		1258	16	11.6					
		1810	18	11.9					
		2115	17	8.4					

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR <u>a</u> (ug/l)	PHEO <u>a</u> (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR09	08/26	0045	15	7.0	2	0.30	0.54		
		0430	14	7.1					
		08/25-26	9999						
WR09A	08/23	0908	16	9.4				3.96	4.15
		1251	18	9.4					
		1905	18	9.3					
		2115	18	8.7					
		08/24	0100	17					
	08/24	0435	16	8.6				4.30	2.52
		0913	17	8.8					
		1311	15	9.0					
		1825	16	9.9					
		2130	16	9.2					
	08/25	0055	15	9.0					
		0438	15	9.3					
		0905	14	9.3					
		1302	15	10.0					
		1820	18	9.5					
	08/26	2125	18	9.1					
		0050	15	8.9					
		0435	14	8.9					
WR11A	08/23	1915	18	9.0					
		2130	18	7.9					
	08/24	0115	17	7.4					
		0450	16	7.4					

TABLE 3, con't
AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR <u>a</u> (ug/l)	PHEO <u>a</u> (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR11A	08/24	0923	16	7.8					
		1319	16	8.9					
		1840	17	9.1					
		2145	16	8.6					
	08/25	0110	15	8.1					
		0450	15	8.0					
		0911	14	7.9					
		1310	15	11.0					
		1825	18	10.4					
		2135	17	8.4					
WR11	08/26	0105	16	7.7					
		0450	14	7.8					
	08/23	0916	16	9.3				4.82	5.21
		1259	18	9.9		0.15	0.41	3.87	2.53
		1925	18	8.8					
		2145	18	8.8					
	08/24	0110	17	8.5					
		0445	16	8.7					
	08/23-24	9999			3	0.15	0.41		
	08/24	0929	16	8.9				8.38	5.48
		1325	16	8.9				14.19	7.14
		1845	17	9.1		0.10	0.43		
		2155	16	9.2					
	08/25	0105	15	9.0					
		0445	15	9.2					
	08/24-25	9999			3	0.30	0.53		

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR03	08/23	0820	16	8.9		K0.05	0.20	2.28	2.89
		1211	16	9.1				1.72	2.01
		1650	20	8.9					
		2020	20	8.4					
	08/24	0010	18	8.2	1	K0.05	0.12		
		0350	16	8.8					
	08/23-24	9999							
		0832	18	8.7				1.85	3.32
		1233	18	8.7				1.89	2.59
		1655	18	8.7		K0.05	0.13		
	08/25	2030	18	8.8					
		0010	15	8.7	2	K0.05	0.13		
	08/24-25	0401	14	8.8					
		9999							
	08/25	0820	16	8.6				4.30	3.70
		1213	17	9.3				2.89	3.52
		1710	19	9.1					
		2025	18	9.0					
	08/26	0000	16	8.8	2	K0.05	0.13		
		0345	15	8.9					
	08/25-26	9999				K0.05	0.13		
WR12	08/23	0833	14	9.6				1.29	1.06
		1219	17	9.8					
		1725	17	8.7					
		2035	17	J8.1					

TABLE 3, con't
 AMBIENT WATER QUALITY RESULTS

STATION	DATE (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	D.O. (ppm)	BOD ₅ (mg/l)	NITROGEN (mg/l)		CHLOR _a (ug/l)	PHEO _a (ug/l)
						NH ₃	NO ₂ -NO ₃		
WR12	08/24	0020	16	8.6	J2	K0.05	0.18	2.66	1.39
		0400	15	8.6					
	08/23-24	9999							
	08/24	0840	15	10.4		K0.05	0.22		
		1240	14	9.1					
		1725	17	8.7					
		2045	15	8.7					
	08/25	0020	14	8.7	J1	K0.05	0.23		
		0408	14	9.1					
	08/24-25	9999							
	08/25	0830	13	7.8				1.76	1.60
		1225	15	9.8					
		1730	17	9.3					
		2045	16	9.6					
	08/26	0013	14	8.7	J1	K0.05	0.26		
		0400	13	9.1					
	08/25-26	9999							

TABLE 4
LONG TERM BOD RESULTS

STATION	DATE OF COLLECTION 1977	CUMULATIVE BOD IN MG/L AT DAY INDICATED																					
		2	3	5	7	9	11	13	14	15	16	17	18	19	21	22	23	24	25	26	28	29	30
BENNO2	8/23-24 8/24-25 8/25-26	21		46	51	56		62			68			71			72		76				90
			40	45	45		65			80			80			65			85		85	95	
			J30	J45	65		70		70		70				70			80					
Fafa01	8/23-24 8/24-25 8/25-26	15		46	52	60		64			75			76			81		85				87
			25	42	50		60			70			70			72			88		63	78	
			11	25	26		38		47			51			59			59					
COLU01	8/23-24 8/24-25 8/25-26	7		18	22	39		55			74			78			86		87				88
			11	16	20		31			58		64				64			66			66	
			6	13	16		28		48			50			58			58			62		
WR04	8/23-24 8/24-25 8/25-26		J1	J2	3	4		4			4			4			4		4				6
			J1	J1	J2		J2			2			3			3			3		4	4	
			J1	1	2		2		2			3			3			3					
WR07	8/23-24 8/24-25 8/25-26		J1	3	4	4		4			4			4			6		7				8
			2	4	4		5			6			7			10			10				12
			2	3	3		5			5			5			5		5			5		
WR09	8/23-24 8/25-25 8/25-26	J1		2	4	4		5			5			5			6						7
			J2	3	4		5			5			7						8			8	
			1	2	2		3		4			4			5			6			7		
WR11	8/23-24 8/24-25 8/25-26	2		3	4	5		6			6			6			6		7				8
			J2	3	4		5			6			7			8			8				
			J1	2	2		3		3			4			5			6			6		
WR12	8/23-24 8/24-25 8/25-26	J1		J2	J2	3		4			4			3			3		4				4
			J0	J1	J1		J2			2			2			2			2			4	
			J1	J1	J1		2		2			2			2			2			2		

TABLE 5

Continuous Dissolved Oxygen and Temperature Recorder Results

Station	Date (1977)	Time (hours)	DO (mg/l)	Temp. (°C)		
WR07	8/23	1200	10	Recorder inoperative		
		1300	10.6			
		1400	11.5			
		1500	11.5			
		1600	11.2			
		1700	11.0			
		1800	9.7			
		1900	9.0			
		2000	8.0			
		2100	7.8			
		2200	6.8			
		2300	6.4			
	8/24	0000	6.4			
		0100	6.2			
		0200	6.0			
		0300	6.0			
		0400	6.4			
		0500	6.2			
		0600	6.2			
		0700	6.4			
		0800	6.8			
		0900	-			
		1000	7.2			
		1100	8.5			
		1200	8.8			
		1300	9.0			
		1400	9.0			
		1500	8.3			
		1600	Recorder malfunction			
		8/25	1230		12.0	
			1300		12.7	
			1400		13.0	
	1500		13.5			
	1600		13.0			
	1700		13.0			
	1800		12.0			
	1900		11.0			
	2000		9.7			
	2100		8.7			
				Last good reading		

TABLE 5, con't

Continuous Dissolved Oxygen and Temperature Recorder Results

Station	Date (1977)	Time (hours)	DO (mg/l)	Temp. (°C)
WR09	8/23	1220	10.5	Recorder inoperative
		1300	11.6	
		1400	12.0	
		1500	13.0	
		1600	13.4	
		1700	13.0	
		1800	12.0	
		1900	10.8	
		2000	10.0	
		2100	8.8	
		2200	7.8	
		2300	7.1	
	8/24	0000	6.7	
		0100	6.2	
		0200	6.0	
		0300	5.8	
		0400	5.7	
		0500	5.6	
		0600	5.4	
		0700	5.7	
		0800	5.8	
		0900	6.0	
		1000	6.3	
		1100	6.4	
		1200	6.8	
		1300	7.6	
		1400	8.3	
		1500	8.8	
		1600	9.0	
		1700	9.0	
		1800	9.5	
		1900	9.1	
		2000	8.9	
		2100	8.0	
		2200	7.3	
		2300	7.0	
	8/25	0000	6.8	
		0100	6.5	
		0200	6.2	
		0300	6.0	
		0400	6.0	
		0500	6.1	

TABLE 5 , con't

Continuous Dissolved Oxygen and Temperature Recorder Results

Station	Date (1977)	Time (hours)	DO (mg/l)	Temp. (°C)
WRO9	8/25	0600	6.0	
		0700	6.2	
		0800	6.4	
		0900	7.0	
		1000	7.9	
		1100	10.0	
		1200	11.4	
		1300	12.0	
		1400	12.8	
		1500	13.8	
		1600	14.4	
		1700	14.0	
		1800	13.6	
		1900	12.5	
		2000	11.2	
		2100	10.0	
		2200	9.0	
		2300	8.2	
	8/26	0000	7.6	
		0100	7.0	
		0200	6.7	
		0300	6.5	
		0400	6.2	
		0500	6.1	
		0600	6.1	
		0700	6.0	
		0800	6.4	
		0900	7.0	

TABLE 5, con't

Continuous Dissolved Oxygen and Temperature Recorder Results

Station	Date (1977)	Time (hours)	DO (mg/l)	Temp. (°C)
WR11A	8/23	1345	11.4	16.0
		1400	11.5	16.0
		1500	11.4	16.0
		1600	11.7	16.0
		1700	11.1	16.0
		1800	10.4	16.0
		1900	10.0	16.0
		2000	9.2	16.0
		2100	8.7	16.0
		2200	8.4	16.0
		2300	8.0	16.0
	8/24	0000	8.0	16.0
		0100	7.8	16.0
		0200	7.4	16.0
		0300	7.6	16.0
		0400	7.8	16.0
		0500	7.8	16.0
		0600	7.8	16.0
		0700	7.8	16.0
		0800	7.8	16.0
		0900	7.8	16.0
		Stirrer malfunction		
	8/25	1000	9.0	13.0
		1100	9.8	13.0
		1200	10.3	14.0
		1300	11.0	14.0
		1400	11.3	15.0
		1500	11.5	15.0
		1600	11.5	15.0
		1700	11.6	15.0
		1800	11.2	16.0
		1900	10.2	16.0
		2000	9.0	16.0
		Stirrer malfunction		

TABLE 6
FLOWS AT THE BENNINGTON, VT U.S.G.S. GAGE

DATE (1977)	DAILY AVERAGE (CFS)	DAILY MAXIMUM		DAILY MINIMUM	
		TIME (HOURS)	FLOW (CFS)	TIME (HOURS)	FLOW (CFS)
08/23	134	0015	164	2300	114
08/24	113	2330	125	0430	110
08/25	124	0545	133	2230	112
08/26	104	0015	112	2400	95
11/10	202*	--	--	--	--

*Flow during the time of travel study remained constant. This is the flow during the 4 hour study period.

TABLE 7
WASTEWATER EFFLUENT RESULTS

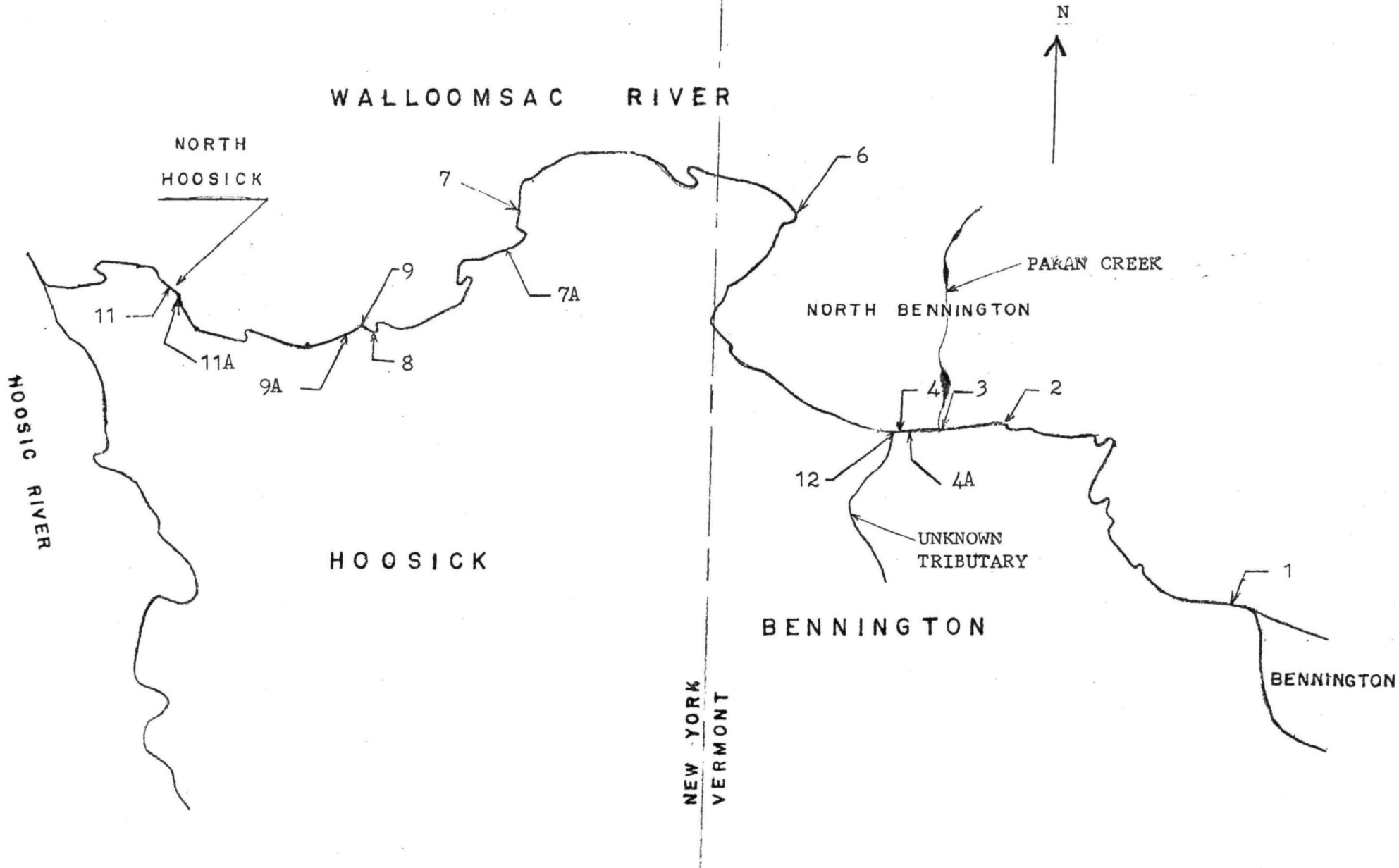
STATION	DATE OF COLLECTION (1977)	TIME OF COLLECTION (HOURS)	TEMP (°C)	DO (mg/l)	BOD ₅ (mg/l)	TNFR (mg/l)	NITROGEN (mg/l)		
							TKN	NH ₃ -N	NO ₂ -NO ₃
BENNO2	08/23-24	9999	--	--	46	26	16.8	14.0	0.32
	08/24	1045	--	5.0	--	--	--	--	--
	08/24-25	9999	--	--	45	27	17.4	14.0	0.26
	08/25	0730	19	6.1	--	--	--	--	--
	08/25-26	9999			J45	29	13.8	9.8	0.24
FAFA01	08/23-24	9999	--	--	46	57	13.8	9.2	0.09
	08/24	0840	23	3.7	--	--	--	--	--
	08/25	0800	--	1.9	--	--	--	--	--
		0810	17	--	42	47	14.1	9.8	0.07
	08/25-26	9999	--	--	25	49	13.2	7.0	0.05
COLU01	08/23-24	9999	--	--	18	--	10.2	5.4	0.41
	08/24	0840	23	3.7	--	--	--	--	--
	08/24-25	9999	--	--	16	--	9.4	4.9	0.35
	08/25	0930	--	3.8	--	--	--	--	--
	08/26	0920	--	--	13	--	8.1	3.2	0.38

TABLE 8

WASTEWATER TREATMENT PLANT FLOWS

Location	Date 1977	24 Hour Flow			
		EPA Recorder		WWTF Recorder	
		MGD	CMS	MGD	CMS
BENN02	8/23-24	3.71	0.162	4.36	0.191
	8/24-25	3.73	0.163	4.32	0.189
	8/25-26	3.61	0.158	4.30	0.188
FAFA01	8/23-24	0.031	0.001	-	-
	8/24-25	0.029	0.001	-	-
	8/25-26	0.030	0.001	-	-
COLU01	8/23-24	-	-	1.00	0.044
	8/24-25	-	-	1.11	0.049
	8/25-26	-	-	1.03	0.045

FIGURE 1
WALLOOMSAC RIVER STUDY AREA



APPENDIX I

APPENDIX I

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: November 16, 1977

SUBJECT: Walloomsac River Time of Travel Study

FROM: Donald P. Porteous
Sanitary Engineer, Water Section



TO: Allen Ikalainen, Acting Chief
System Analysis Branch

Attachment 1 contains the results of our time of travel study of November 10, 1977 on the Walloomsac River. When comparing our results with those supplied by the Vermont AEC in their letter of October 06, 1977, please note that the station designations and the absolute mileage between stations are different. Taking these factors into account, the times of travel appear to be compatible.

Also, to clear up the station designations used by EPA and the AEC during these studies, please see Attachment 2.

If you have any questions, please call me.

ATTACHMENT 1

Time of Travel Study
November 10, 1977

Reach Descriptions

1. 0.01 miles above Henry Bridge {WRO4} to WRO6
2. WRO6 to WR7A
3. WR7A to WRO9

Dye Dumpings

- A. Dump at beginning of Reach One and pick up at WRO6 and WR7A
- B. Dump at beginning of Reach Two and pick up at WR7A and WRO9

<u>REACH</u>	<u>DUMP</u>	<u>DISTANCE</u> {miles}	<u>TIME</u> {minutes}	<u>VELOCITY</u> {feet per second}	<u>FLOW</u> {cubic feet per second}
1	A	2.27	148	1.35	202
2	A	1.92	121	1.40	202
	B	1.92	112	1.51	202
3	B	2.64	178	1.31	202

ATTACHMENT 2

AEC VS. EPA TIME OF TRAVEL STATION LOCATIONS

<u>AEC Designation</u>	<u>Description</u>	<u>EPA Designation</u>
EPA 8	Dam 0.01 mile above Henry Bridge Station	WRO4
—	Bennington WWTF	—
EPA 10	Walloomsac River, 1/2 mile east of N.Y. state line off Harrington Rd., 0.19 miles from intersection with Rte. 67	WRO6
EPA 11	First bridge below state line	WRO7
—	Abandoned railroad bridge	WR7A
EPA 12	Second bridge below state line	WRO8
EPA 13	Dam at Columbia Paper	WRO9

River miles for each station have previously been sent to you.

APPENDIX II

APPENDIX II

November 28, 1977

Walloomsac River

David W. Tordoff, Environmentalist
Water Section

Allen Ikalainen, Acting Chief
Systems Analysis Branch

The following is a description of the Wallomsac River based on notes written by me during a November 09, 1977 reconnaissance.

I. Commence/reconnaissance of the Wallomsac River from Peran Creek (North Bennington, VT) to Columbia Paper Co., (Walloomsac, NY).

1. Walked to confluence of Peran Creek with the Walloomsac River.
 - a. Noted river seemed to have fast flow.
 - b. No rapids observed.
2. Drove westerly to Henry Bridge and crossed the river.
 - a. River appears flat to the dam.
 - b. About 500 ft. of rapids below the dam.
3. Proceeded along river road to U.S.G.S. gauge.
 - a. Gauge indicated 2.57 ft. of water.
4. Continued westerly along River Road.
 - a. Ripples about 0.1 mi. below gauge.
 - b. Rapids about 0.45 mi. below Henry Bridge. These are about 100 ft. long.
 - c. Minor rapids about 0.85 mi. below Henry Bridge.
 - d. Rapids (with about 6" drop) 1 mi. below Henry Bridge situated near the point where road turns away from river.
 - e. Returned to Henry Bridge, crossed river, continued along the north side road.

NOTE: Mileages are based on vehicle odometer readings.

5. Rapids mentioned in item 4d are 0.98 mi. below Henry bridge traveling on the north side.
6. An island is located at the S curve just above last summer's station #006.
7. Rapids at last summer's station #006.
8. Quiescent pool, then rapids (about 0.2 mi.), the flat (about 0.1 mi.) the rapids with 1.5' fall between bend and State line.

9. Rapids above and below railroad bridge; also, an island separates the flow.
 10. The rapids turn calm at the first bridge in New York.
 - a. More minor rapids about 0.2 mi. below bridge.
 11. Minor rapids (little more than ripples), below the abandoned trolley bridge (Walloomsac Survey station 7A).
 12. River appears quiet after the bridge known as station #008.
 13. There is a pond above the dam at Columbia Paper Co. in Walloomsac Village.
 14. Rapids below dam at Columbia Paper Co.
 15. These rapids lead to a pool westerly of the bridge at the Paper Mill.
- II. Cross section conducted at the abandoned trolley bridge (about river mile 5.35)
1. 67 ft. between abutments.
 2. Facing upstream - the left edge of water is the north side of the river (Rta. 67 side).
 3. Data:

LEW	0' out from bank, 1 ft. deep
	4' out from bank, 1 ft., 6" deep
	8'6" out from bank, 2 ft. deep
	12' out from bank, 2.5 ft. deep
	16' out from bank, 3.5 ft. deep
	21' out from bank, 3.5 ft. deep
	25' out from bank, 3 ft., 5" deep
	28' out from bank, 2 ft., 9" deep
	31' out from bank, 3 ft. deep
	34' out from bank, 2 ft., 6" deep
	37' out from bank, 2 ft., 9" deep
	40' out from bank, 3 ft. deep
	44' out from bank, 3 ft., 8" deep
	49' out from bank, 2 ft., 1" deep
	53' out from bank, 3 ft. deep
	58' out from bank, 4 ft. deep
	63' out from bank, 4 ft., 10" deep
REW	67' out from bank, 1 ft., 6" deep