SNOW CREEK, ANNISTON, ALABAMA

Description of Study Area

Snow Creek is located in Calhoun County, Alabama, and drains a predominantly industrial area in the southwest portion of the City of Anniston. The headwaters are formed by north and west branches whose confluence is located in the NE¼ of the SE¼ of Section 1, T16S, R7E. The flow of the creek is generally in a southerly direction to its confluence with Choccolocco Creek in the SW¼ of Section 29, T17S, R8E. Portions of the creek are concrete lined and several storm sewers serving the Anniston urban area empty into the creek. The creek bed was found to contain much debris and litter normally associated with an urban area. There were no hydrologic or geologic peculiarities noted during the field study.

All known point source dischargers to Snow Creek are industrial. The west branch of the creek receives wastewaters from FMC Foundry and FMC manufacturing divisions. Dresser Industries discharge to the north branch. Wastewater from Monsanto Chemical Company enters a ditch parallel to the Southern Railroad and a second ditch containing Monsanto wastewater passes under Alabama Highway 202 and the two ditches join before discharging to Snow Creek near Eleventh Street. Further downstream, U.S. Pipe and Foundry contributes a discharge to Snow Creek. Urban storm runoff appears to be a potentially significant non-point source.

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Results

Model Calibration and Verification

Model calibration and verification was not entirely satisfactory due to an apparant algal influence in the creek. The extent of this influence is uncertain but was obvious in September 78 data as shown in Figure 3 . D.O. values at Station S-8 appear influenced by algal processes.

The only significant indication of a nitrogenous demand was found at Station S-1 on February 2, 1978. This station is the uppermost in the west branch of the creek and the source of this nitrogen is unknown. Due to the absence of NH_3-N in any of the known point source dischargers and due to the absence of any significant NH_3-N detected in the creek, no attempt was made to calibrate NBOD, and the NBOD was carried at a background level of 1.0 during the model work.

The following results from the model calibration and verification work is presented in this report:

Figure 1 - Location of Sampling Stations

Table 1 - Description of Sampling Sites

Table 2 - Stream Velocities

Table 3 - Flow Values

Table 4 - Effluent Characteristics

Table 5 - Model Parameters

Figure 2 - SNSIM Sections and Distances

Figure 3 - Calibration - DO

Figure 4 - Calibration - CBOD

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Figure 5 - Verification - DO

Figure 6 - Verification - CBOD

Table 6 - Summary of Field Data

Table 7 - Summary of Field Data

Table 8 - Summary of Field Data

Table 9 - Summary of Field Data

Waste Load Allocation

All known point source dischargers to Snow Creek are industrial. BAT for the categories which include these industries either has not been published or does not include NH_3-N and BOD effluent limitations. An evaluation was made using 10 year 7 day low flows, an assumed headwaters DO saturation of 85%, and all other parameters the same as those used during the calibration run. The results of this run indicated no problems maintaining a minimum DO of 3 ppm as a result of point source discharges of NH_3-N and BOD_5 at levels measured during the sampling periods. The impact of urban storm water runoff on this stream has not been evaluated and may be a significant factor.

Recommendations

(1) It does not appear that waste load allocations are appropriate at this time.

(2) The affects of urban stormwater runoff should be considered in any future allocation procedures.

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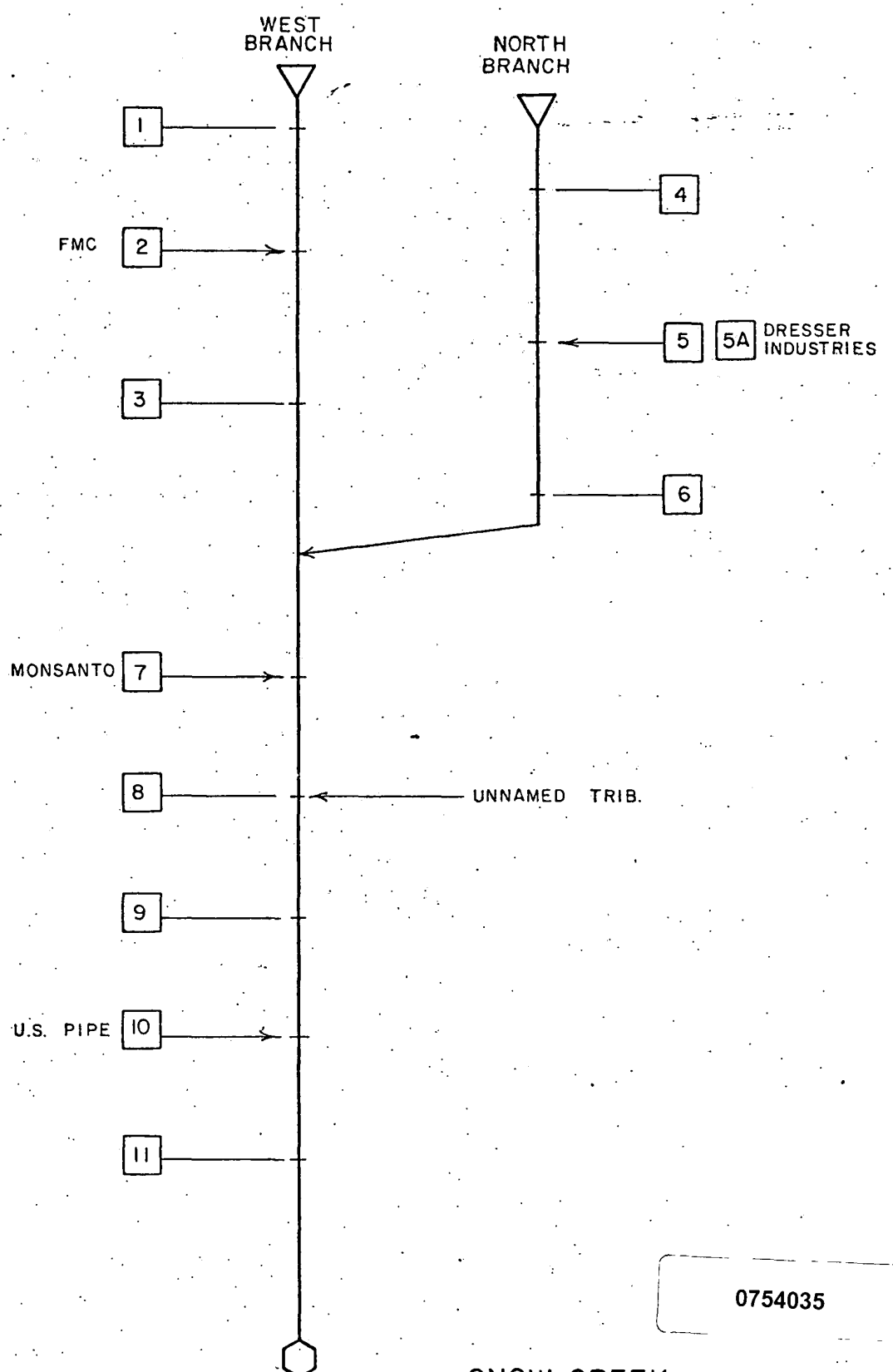

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SNOW CREEK
LOCATION OF SAMPLING STATIONS

TABLE 1

Description of Sampling Sites

Station	SNSIM Distance (miles)	Description
S-1	0.0	Samples were taken at the 10th Street bridge located in the NE¼ of the NW¼ of Section 12, T16S, R7E. The stream bed consisted of silt and concrete rubble with clay banks approximately five feet high. On occasion, oil was visible on the water surface. Upstream there was an approximate 80% vegetative cover.
S-2	.09	Sampes were collected at a concrete box equipped with a one foot rectangular wier at the FMC manufacturing discharge 001 located approximately 500 feet downstream from Station 1. The effluent leaving this box is piped to Snow Creek.
S-3	.682	Samples were collected at a culvert at Crawford Avenue in the SE¼ of the SE¼ of Section 1, T16S, R7E. The stream bed was clay and silt with vertical clay banks. There was approximately 50% vegetative cover upstream.

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Station	SNSIM Distance (miles)	Description
S-4	N/A	Samples were collected at the downstream end of a culvert under Cooper Avenue in the SW¼ of the SW¼ of Section 31, T15S, R8E. The stream bed consisted of rubble and pebbles and was littered with debris such as tires, plastic bottles, etc.
S-5	N/A	Samples were collected from Dresser Industries discharge 001 located approximately 500 feet downstream from Station 4. This discharge flowed from a three foot diameter pipe into a ditch running parallel to the L & N Railroad. This ditch joined the north branch of Snow Creek near 20th Street. Samples were collected from the pipe as it discharged to the ditch.
S-5A	N/A	Samples were collected from Dresser Industries discharge 002. This discharge was located on the south side of Dresser Industries between 23rd Street and a spur line from the L & N Railroad approximately 300 feet downstream from Station 5A. The effluent entered a ditch parallel to the spur line and flowed westward to a junction with the main ditch.

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Station	SNSIM Distance (miles)	Description
S-6	N/A	Samples were collected from the upstream side of the 15th Street bridge approximately 200 feet upstream from the confluence of the north and west branches in the NE¼ of the SE¼ of Section 1, T16S, R7E. There was little vegetative cover at this point in the stream. A pool extended upstream from the bridge approximately 50 yards.
S-7	1.0	Samples were collected from a ditch containing Monsanto's waste discharge at a point approximately 200 yards above its confluence with Snow Creek near a railroad bridge in the SW¼ of the SW¼ of Section 6, T15S, R7E.
S-8	2.1	Samples were collected at the 4th Street bridge in the NE¼ of the SE¼ of Section 7, T16S, R8E. The stream at this station is contained in a concrete channel with walls approximately 10 feet high and a flat bottom 25 feet wide. No vegetative cover was present in the vicinity.
S-9	3.56	Samples were taken from a railroad bridge 20 yards upstream from the Noble Street bridge in the NE¼ of the NE¼ of Section 19, T16S, R8E. The stream bed consisted of rubble and pebbles and was approximately 45 feet wide. There was little vegetative cover in the vicinity of this station.

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Station	SNSIM Distance (miles)	Description
S-10	3.93	Samples were collected from U.S. Pipe's discharge at a six inch pipe projecting from a rock wall on the right side (viewed downstream) of Snow Creek approximately 6 feet above the stream bed. This point is in the SE¼ of the NE¼ of Section 19, T10S, R8E immediately above an intermittent tributary.
S-11	4.48	Samples were collected at the Snow Creek bridge in the SW¼ of the SW¼ of Section 20, T16S, R8E. The stream bed consisted of rubble and pebbles and was approximately 30 feet wide.

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STREAM VELOCITIES (fps)

Section	1	2	3	4	5	6
Calibration	.215	.215	.276	.276	.276	.276
Verification	.440	.440	.507	.507	.507	.507
Low Flow Simulation	.215	.215	.276	.276	.276	.276

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FLOW VALUES, SNOW CREEK

Station	Flow Determination		USGS M-7 10 Estimate cfs (accuracy)	Flow, Low Flow Simulation (cfs)
	Calibration	Verification		
S-1	.78	1.11		
(FMC) S-2	.47	.72		.47
S-3	1.25	1.83	0.5 (fair)	.5
S-6	1.18	1.04		
Monsanto S-7	1.03	3.39		1.03
Trib. @ S-8	0.3	4.04		.3
S-8	3.46	6.26		
U.S. Pipe S-10	.15	.18		.15
S-11	3.91	10.48	2.0 (fair)	2.0

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EFFLUENT CHARACTERISTICS, SNOW CREEK

Location	Calibration (25°C)			
	Flow Rate (cfs)	DO (mg/l)	CBOD (mg/l)	NBOD (mg/l)
S-2 (FMC)	.47	7.8	6.67	1.0
North Branch	1.18	6.2	4.67	1.0
S-7 (Monsanto)	1.03	5.2	11.0	1.0
Trib @ S-8	.3	6.2	4.67	1.0
S-10 (U.S. Pipe)	.231	5.1	36.0	1.0
Verification (15°C)				
S-2 (FMC)	.72	8.4	9	1
North Branch	1.04	6.7	6.67	6.24
S-7 (Monsanto)	3.39	8.5	8	1
Trib @ S-8	4.04	6.7	6	6
S-10 (U.S. Pipe)	.227	6.7	41	0

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MODEL PARAMETERS, SNOW CREEK (at 20°C)

Section	KR/day	KC/day	KD/day	KM/day	KN/day	Low Flow KR/day
	Calibration					
1	8.92	.2	.2	.2	.2	8.92
2	3.59	.2	.2	.2	.2	3.59
3	8.54	.2	.2	.2	.2	8.54
4	8.88	.2	.2	.2	.2	8.88
5	7.37	.2	.2	.2	.2	7.37
6	1.48	.2	.2	.2	.2	1.48
	Verification					
1	18.24	.2	.2	.2	.2	
2	7.35	.2	.2	.2	.2	
3	15.69	.2	.2	.2	.2	
4	16.31	.2	.2	.2	.2	
5	13.55	.2	.2	.2	.2	
6	2.72	.2	.2	.2	.2	

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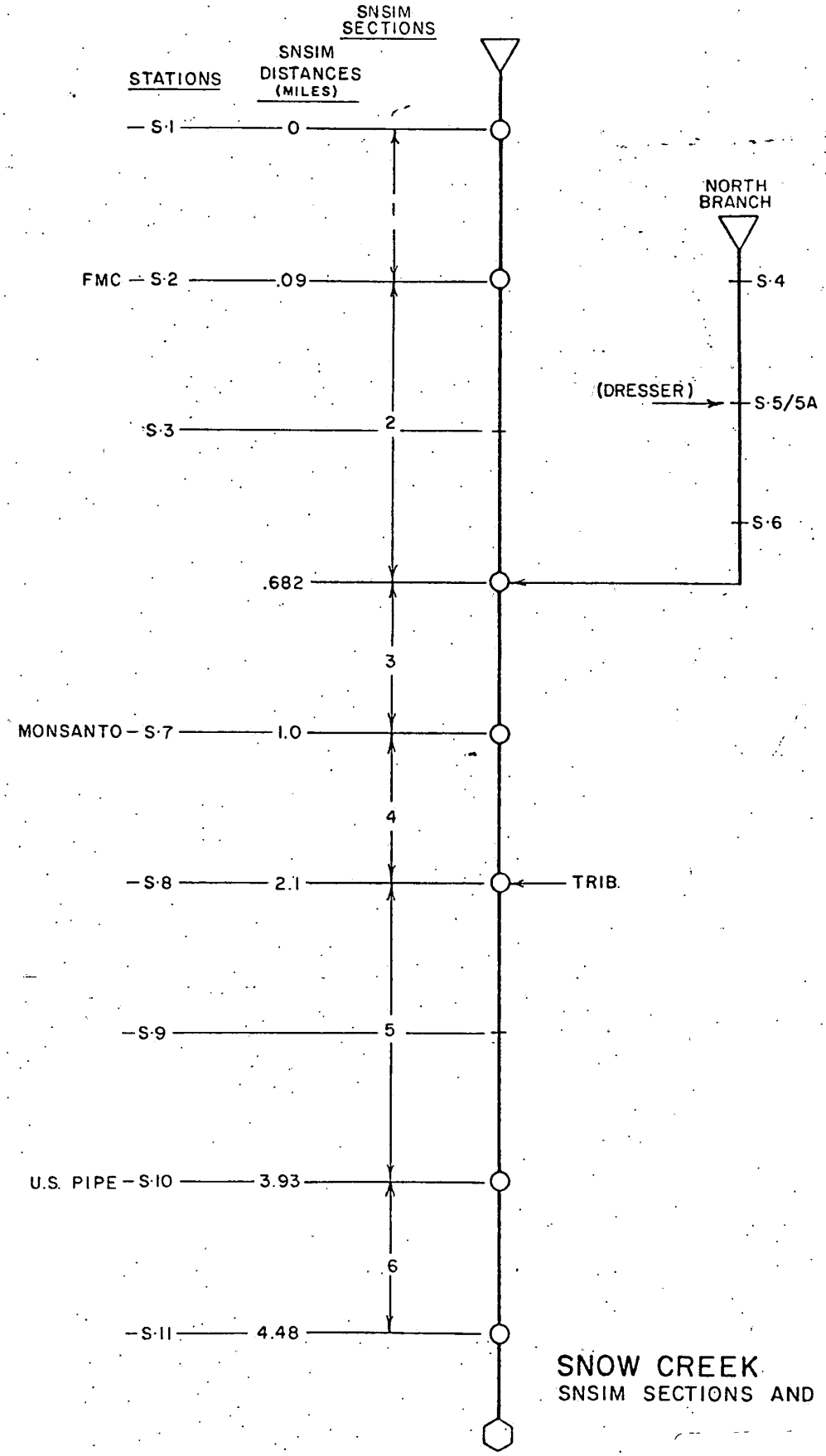

SNOW CREEK
SNSIM SECTIONS AND DISTANCES

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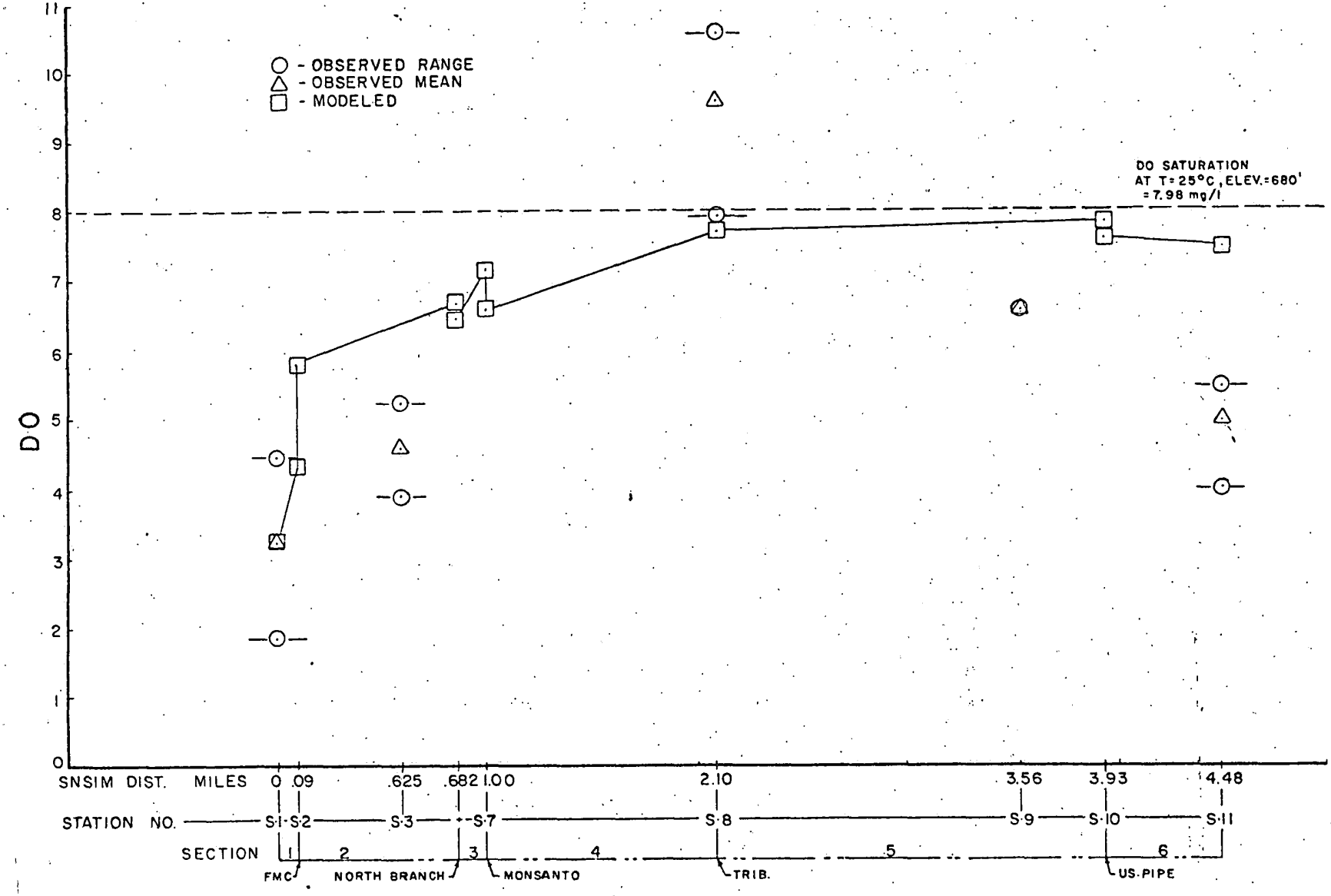

SNOW CREEK
CALIBRATION · DO · SEPT. '78 DATA

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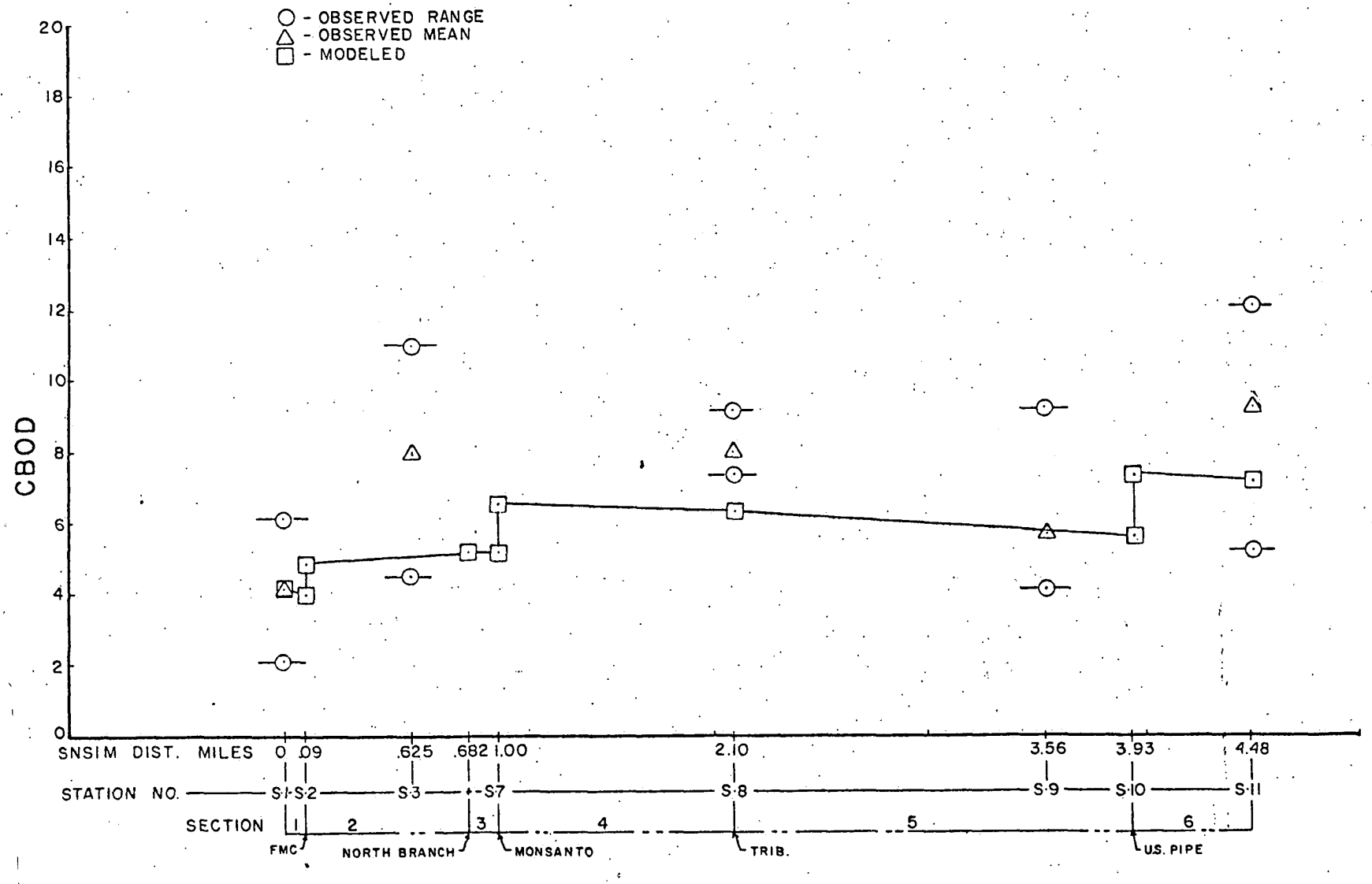

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SNOW CREEK
CALIBRATION · CBOD · SEPT. '78 DATA

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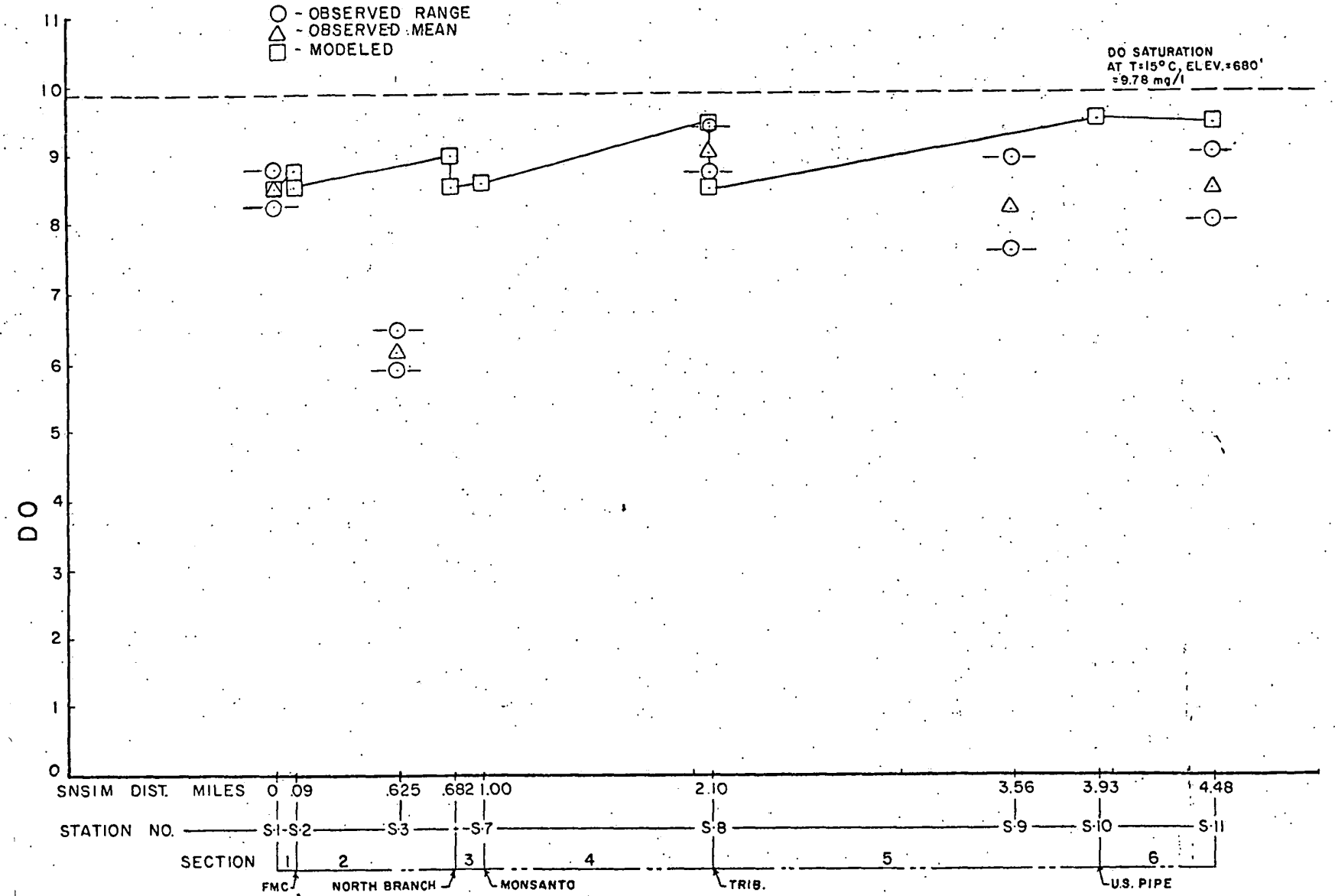

SNOW CREEK
VERIFICATION · DO · DEC. '77 DATA

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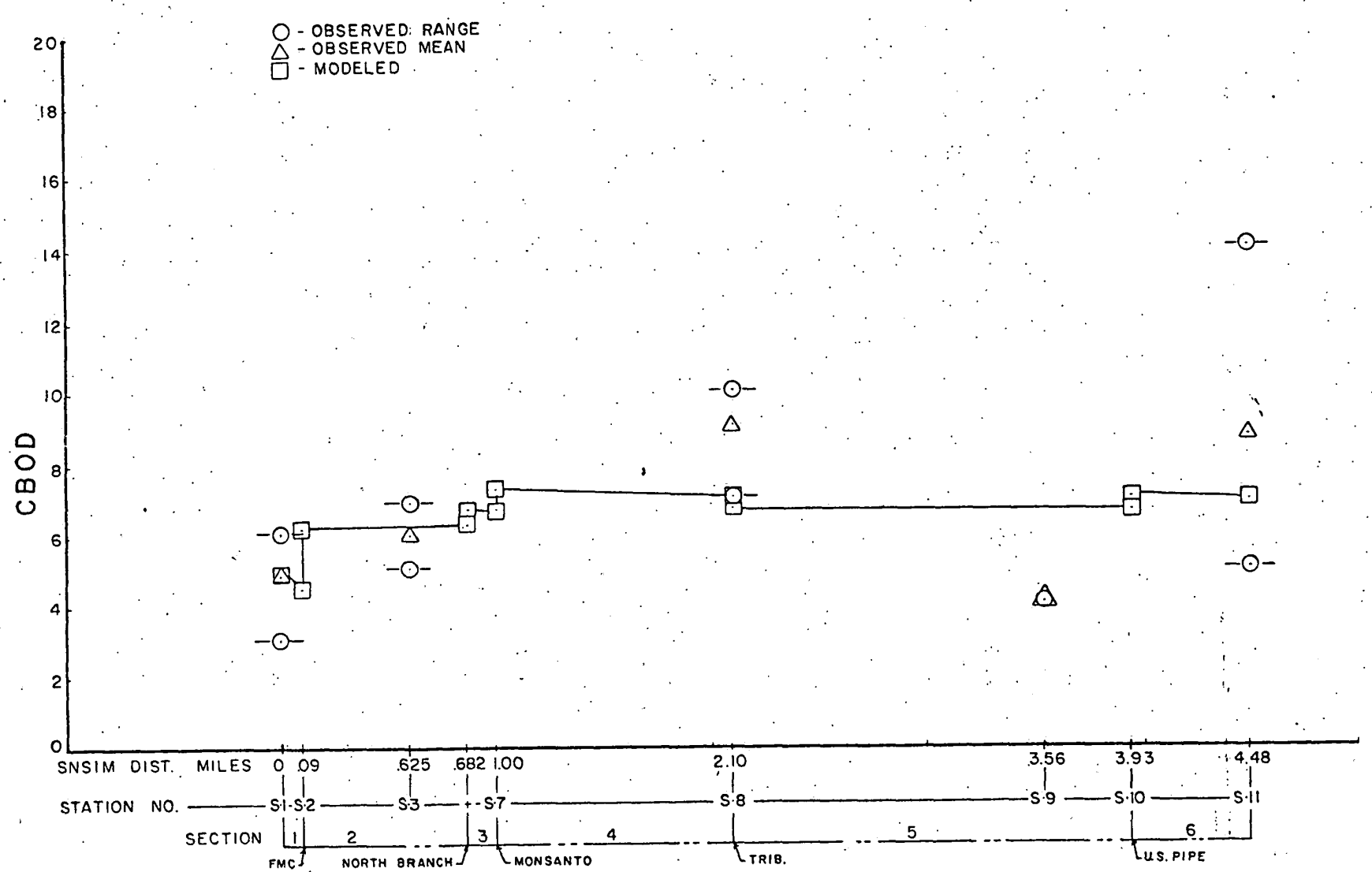

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SNOW CREEK
VERIFICATION · CBOD · DEC. '77 DATA

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SNOW CREEK			Air Temp °C	Water Temp °C	pH (Units)	DO	NO_2-N	NO_3-N	NH_3-N	TKN	PO_4-P	TOC	Turbidity (JTU)	BOD_2	BOD_4	BOD_6	BOD_8	BOD_{10}	Cr(+7)	Zn	Oil & Grease	TSS	Fe
Station Number	Date	Time																					
S-1	11-30-77	8:40	15	16	7.2	8.5	<.02	1.09	<1.0	<1.0	0.06	12	8	0.6	0.7	1.4	1.8	2.0					
	12-1-77	8:45	16	15	7.4	8.3	<.02	1.13	<1.0	<1.0	0.09	12	6	0.4	1.6	2.0	2.5	2.4					
	12-2-77	8:45	7	12	7.6	8.7	<.02	1.47	<1.0	<1.0	0.24	10	15	1.1	3.8	4.7	5.6	5.4					
S-2	11-30-77	9:00	15	20	7.1	8.5								2.6	10.6	13.4	14.2	>16.8	<0.1	<0.1	6		
	12-1-77	8:55	10	22	7.4	8.0								0.2	2.2	2.8	3.8	3.2	<0.1	<0.1	<1		
	12-2-77	8:50	7	18	7.7	8.6								0.4	4.2	5.0	6.2	5.4	<0.1	<0.1	3		
S-3	11-30-77	8:30	15	19	6.9	5.9	0.14	0.68	<1.0	<1.0	<.05	9	4	2.6	3.9	5.1	6.0	5.8					
	12-2-77	8:35	10	17	7.4	6.3	0.14	0.62	<1.0	<1.0	<.05	13	3	2.2	3.9	4.2	5.1	4.7					
	12-2-77	8:35	7	16	7.7	6.4	0.18	0.68	<1.0	<1.0	0.06	12	8	2.0	1.3	6.6	>7.7	>7.7					
S-4	11-30-77	7:45	15	14	7.0	7.3	0.12	0.26	<1.0	<1.0	0.08	11	4	0.6	1.0	1.9	3.2	3.8					
	12-1-77	8:00	10	12	7.0	7.7	0.19	0.31	<1.0	<1.0	0.09	9	3	0.5	0.9	2.0	3.4	2.9					
	12-2-77	8:00	6	9	7.5	9.2	0.14	0.42	<1.0	<1.0	0.08	9	6	0.2	1.4	2.3	3.0	2.5					
S-5	11-30-77	7:50	15	16	6.9	6.5															<1	10	0.6
	12-1-77	8:15	10	16	7.5	6.5															<1	16	1.2
	12-2-77	8:10	9	14	10.1	7.0															<1	103	0.9
S-5A	11-30-77	7:50	15	18	8.2	6.5															46	51	2.2
	12-1-77	8:15	10	18	8.5	7.1															---	44	0.7
	12-2-77	8:10	9	16	8.1	7.9															1152	668	5.6
S-6	11-30-77	8:20	15	14	6.9	6.9	0.07	0.38	<1.0	1.2	<.05	9	3	1.5	2.2	2.7	3.5	4.3					
	12-1-77	8:30	10	14	7.3	7.2	0.10	0.41	<1.0	1.2	0.09	14	3	1.1	2.0	2.8	4.2	4.1					
	12-2-77	8:25	8	9	7.9	6.0	<.02	0.44	1.3	1.7	<.05	28	9	6.9	7.2	7.2	>7.4	>7.4					

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SNOW CREEK			Air Temp °C	Water Temp °C	pH (Units)	DO	NO_2-N	NO_3-N	NH_3-N	TKN	PO_4-P	TOC	Turbidity (JTU)	BOD_2	BOD_4	BOD_6	BOD_8	BOD_{10}	TSS	Oil & Grease
Station Number	Date	Time																		
S-7	11-30-77	9:15	15	20	7.8	8.2	0.02	0.14	<1.0	<1.0	0.10	12	2	1.3	1.7	3.3	4.0	4.6		
	12-1-77	9:05	10	19	7.9	8.5	0.02	0.17	<1.0	<1.0	0.28	4	1	0.0	0.8	1.8	2.0	1.2		
	12-2-77	9:00	6	16	7.7	8.8	<.02	0.14	<1.0	<1.0		10	4	0.2	1.0	1.7	2.0	2.4		
S-8	11-30-77	9:25	15	16	7.2	8.7	0.14	0.38	<1.0	<1.0	0.15	9	2	3.3	4.7	6.0	7.4	7.9		
	12-1-77	9:15	10	14	7.5	9.4	0.08	0.44	<1.0	<1.0	0.16	9	2	1.1	2.0	2.7	4.0	3.7		
	12-2-77	9:05	7	12	7.7	9.0	0.11	0.43	<1.0	<1.0	0.22	7	6	2.1	4.3	5.2	6.5	7.0		
S-9	11-30-77	9:40	16	15	7.4	7.6	0.13	0.38	<1.0	<1.0	0.19	10	2	1.6	2.7	3.3	4.1	4.9		
	12-1-77	9:25	11	14	7.3	8.1	0.09	0.46	<1.0	<1.0	0.19	10	2	0.8	1.9	3.2	3.8	3.6		
	12-2-77	9:15	6	11	7.5	8.9	0.08	0.48	<1.0	<1.0	<.05	12	4	1.0	2.0	2.7	3.5	3.4		
S-10	11-30-77	10:00	16	26	7.4	6.5								>16.8	>16.8	>16.8	>16.8	>16.8	57	27
	12-1-77	9:35	11	28	7.2	6.3								>16.4	>16.4	>16.4	>16.4	>16.4	41	59
	12-2-77	9:25	7	22	7.1	7.2								21	29.5	35.5	>40	>40	32	4
S-11	11-30-77	10:15	16	15	7.5	8.0	0.03	0.59	1.7	1.9	0.15	10	2	2.9	5.0	6.4	8.7	>8.9		
	12-1-77	10:00	14	15	7.6	8.5	0.05	0.61	<1.0	<1.0	0.18	8	2	1.6	2.8	3.6	4.6	4.7		
	12-2-77	9:45	10	11	7.5	8.9	0.07	0.67	<1.0	1.1	0.16	12	4	1.9	3.4	3.7	4.7	4.8		

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SNOW CREEK			Air Temp °C	Water Temp °C	pH (Units)	DO	NO_2-N	NO_3-N	NH_3-N	TKN	PO_4-P	TOC	Turbidity (JTU)	BOD_2	BOD_4	BOD_6	BOD_8	BOD_{10}	$Cr^{(+7)}$	Zn	Oil & Grease	TSS	Fe
Station Number	Date	Time																					
S-1	9-13-78	10:00	25	25	7.8	4.0	<.02	0.98	<1.0	<1.0	0.02	11.0	1.4	0.0	4.0	3.5	5.0	3.0					
	9-14-78	10:00	26	25	8.1	4.4	<.02	1.06	<1.0	<1.0	0.30	23.0	1.2	0.8	1.4	1.6	1.2	2.2					
	9-15-78	10:00	23	24	7.7	1.7	<.02	0.43	<1.0	1.5	0.18	52.0	27	30.1	>36	35	>35	>34					
S-2	9-13-78	10:15	25	23	7.5	6.0		1.94	<1.0	<1.0		30.0		6.4	6.3	>6.8	6.7	>6.9	<.05	0.05	10.1		
	9-14-78	10:10	26	22	8.0	6.8		1.32	<1.0	<1.0		30.0		4.1	3.0	3.2	4.4	5.2	<.05	0.10	5.3		
	9-15-78	10:05	23	24	7.8	6.1		1.54	<1.0	<1.0		22.0		4.4	5.0	6.2	6.0	6.4	<.05	0.05			
S-3	9-13-78	9:50	25	25	7.7	4.5	0.48	<1.0	<1.0	<1.0	0.52	41.0	4.5	2.8	6.0	6.2	7.0	7.0					
	9-14-78	9:50	26	24	7.9	5.2	0.14	1.07	<1.0	<1.0	0.10	29.0	4.2	2.2	3.0	3.4	3.2	4.0					
	9-15-78	9:50	22	25	7.8	3.9	0.07	0.76	<1.0	<1.0	0.06	23.0	12	5.8	7.2	8.2	9.0	10.4					
S-5	9-13-78	9:20	24	23	7.9	6.7															71.1	2	0.5
	9-14-78	9:25	24	24	8.1	6.2															28.0	5	0.4
	9-15-78	9:25	22	22	9.5	7.5																5	0.4
S-5A	9-13-78	9:20	24	25	7.9	6.3															1.8	4	>0.1
	9-14-78	9:25	24	22	8.1	6.8															2.3	3	0.2
	9-15-78	9:25	22	22	7.8	6.2																198	0.7
S-6	9-13-78	9:45	24	23	8.1	7.4	<.02	0.04	<1.0	<1.0	0.15	15.0	4.0	1.4	3.4	3.4	3.8	4.0					
	9-14-78	9:45	24	20	7.9	6.2	<.02	0.11	<1.0	1.5	0.20	17.0	3.3	0.6	1.0	1.2	0.8	1.6					
	9-15-78	9:45	22	21	7.9	4.9	0.02	0.38	<1.0	<1.0	0.12	16.0	70	3.2	4.4	5.4	5.8	6.4					
S-7	9-13-78	10:45	25	26	9.6	0.0	<.02	0.05	<1.0	<1.0	0.15	22.0	40	1.0	16.0	14.5	19.5	17.0					
	9-14-78	10:25	26	21	8.6	8.2	<.02	0.06	<1.0	<1.0	0.90	16.0	1.2	3.0	5.5	5.5	1.7	4.5					
	9-15-78	10:15	23	24	8.1	7.4	0.03	0.18	<1.0	<1.0	0.67	6.0	6.5	3.5	5.5	8.0	7.0	7.5					

TOWOLDMON0059563

SNOW CREEK			Air Temp °C	Water Temp °C	pH (Units)	DO	NO_2-N	NO_3-N	NH_3-N	TKN	PO_4-P	TOC	Turbidity (JTU)	BOD_2	BOD_4	BOD_6	BOD_8	BOD_{10}	TSS	Oil & Grease
Station Number	Date	Time																		
S-8	9-13-78	10:45	25	26	7.5	10.4	0.05	0.56	<1.0	<1.0	0.45	19.0	3	1.0	7.0	7.5	7.0	8.0		
	9-14-78	10:35	27	25	8.6	10.8	0.03	0.81	<1.0	<1.0	0.60	24.0	2.2	1.5	4.5	3.5	4.0	6.0		
	9-15-78	10:20	23	24	7.9	7.9	0.03	0.86	<1.0	<1.0	0.31	15.0	12	6.5	7.0	5.0	3.5	10.0		
S-9	9-13-78	10:50	26	23	7.9	6.5	0.07	0.59	<1.0	<1.0	0.60	21.0	3.6	0.6	2.6	2.8	3.4	3.8		
	9-14-78	10:45	27	23	8.0	6.3	0.05	0.61	<1.0	<1.0	0.70	25.0	4.0	1.4	2.2	2.4	2.8	4.0		
	9-15-78	10:30	23	22	7.8	6.4	0.04	0.81	<1.0	<1.0	0.37	16.0	58	5.0	6.0	6.0	1.6	8.4		
S-10	9-13-78	10:55	26	30	7.5	5.6								17.0	25.2	25.8	26.0	33.0	119.6	18.5
	9-14-78	10:55	28	32	7.4	4.8								18.0	28.0	31.0	29.0	40.0	35.0	3.5
	9-15-78	10:40	24	30	7.6	4.8								21.8	26.5	29.2	29.2	32.0	72.7	
S-11	9-13-78	9:00	23	22	7.7	4.9	0.05	0.40	<1.0	<1.0	0.90	24.0	5.5	1.5	6.5	6.0	7.5	9.0		
	9-14-78	9:00	24	22	7.8	4.1	0.05	0.38	<1.0	<1.0	0.62	26.0	3.0	2.9	3.4	4.6	3.0	4.6		
	9-15-78	9:00	22	21	7.6	5.4	0.07	0.63	<1.0	<1.0	0.59	18.0	92	4.2	7.2	9.3	9.2	10.3		

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| SNOW CREEK | | |

SNOW CREEK			Air Temp °C	Water Temp °C	pH (Units)	DO	NO_2-N	NO_3-N	NH_3-N	TKN	PO_4-P	TOC	Turbidity (JTU)	BOD_2	BOD_4	BOD_6	BOD_8	BOD_{10}	TSS	Oil & Grease
Station Number	Date	Time																		
S-7	2-1-78	9:45	5	14	7.9	9.1	0.02	0.47	<1.0	<1.0	1.10	4.5	3.5	0.6	1.7	3.2	3.8	4.1		
	2-2-78	9:40	4	12	7.9	9.0	0.87	0.41	<1.0	<1.0	1.00	10.9	275	>3.4	>8.1	>8.1	>8.2	>8.0		
	2-3-78	9:45	1	12	7.7	8.6	0.14	0.76	<1.0	1.0	4.0	7.3	17	4.6	>8.9	>9.0	>8.9	>8.9		
S-8	2-1-78	9:50	5	9	7.7	10.0	0.06	0.66	<1.0	<1.0	0.90	5.5	7.0	4.7	>6.4	>6.8	>6.9	>6.9		
	2-2-78	9:50	5	9	7.6	9.7	0.03	0.65	<1.0	1.7	1.02	12.7	12	5.1	6.9	>7.7	>8.1	>8.1		
	2-3-78	9:55	2.5	8	7.6	9.8	0.04	0.60	<1.0	<1.0	0.69	9.1	9.5	7.4	>8.0	>8.9	>9.0	>9.0		
S-9	2-1-78	10:20	4	8	7.6	10.4	0.02	0.87	<1.0	<1.0	0.84	6,4	5	1.5	2.0	2.3	2.6	3.4		
	2-2-78	10:00	4	8	7.6	9.3	<.02	0.60	<1.0	<1.0	0.78	3.6	6.5	2.3	3.0	3.5	4.0	4.8		
	2-3-78	10:05	2	7	7.6	9.6	0.02		<1.0	<1.0	0.7	5.5	5.5	2.0	2.4	4.7	5.7	5.7		
S-10	2-1-78	10:40	6	22	7.4	7.3							22	>6.3	>6.1	>6.3	>6.0	>6.3		1.1
	2-2-78	10:15	5	24	7.3	7.0							32	>7.2	>6.9	>6.9	>7.0	>6.9		2.3
	2-3-78	10:20	1	24	7.0	7.5							27	4.0	>6.8	>8.4	>9.0	>8.9		0.3
S-11	2-1-78	10:55	5	9	7.5	10.1	.02	0.86	<1.0	<1.0	0.69	3.6	5	1.1	2.0	2.1	2.4	3.2		
	2-2-78	10:25	5	6	7.5	9.9	.02	0.72	<1.0	<1.0	0.68	4.5	6.5	2.1	2.7	3.1	3.6	4.3		
	2-3-78	10:30	1	8	7.4	10.1	0.03	0.87	<1.0	<1.0	0.62	4.5	12	1.4	2.8	2.9	4.4	5.0		

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