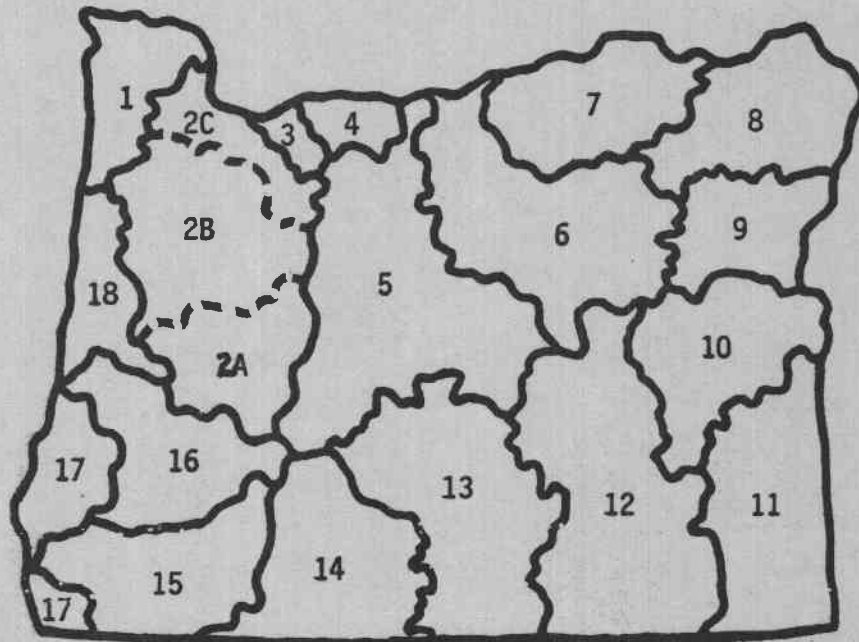


A RESOURCE SURVEY OF RIVER ENERGY
AND LOW-HEAD HYDROELECTRIC POWER POTENTIAL
IN OREGON

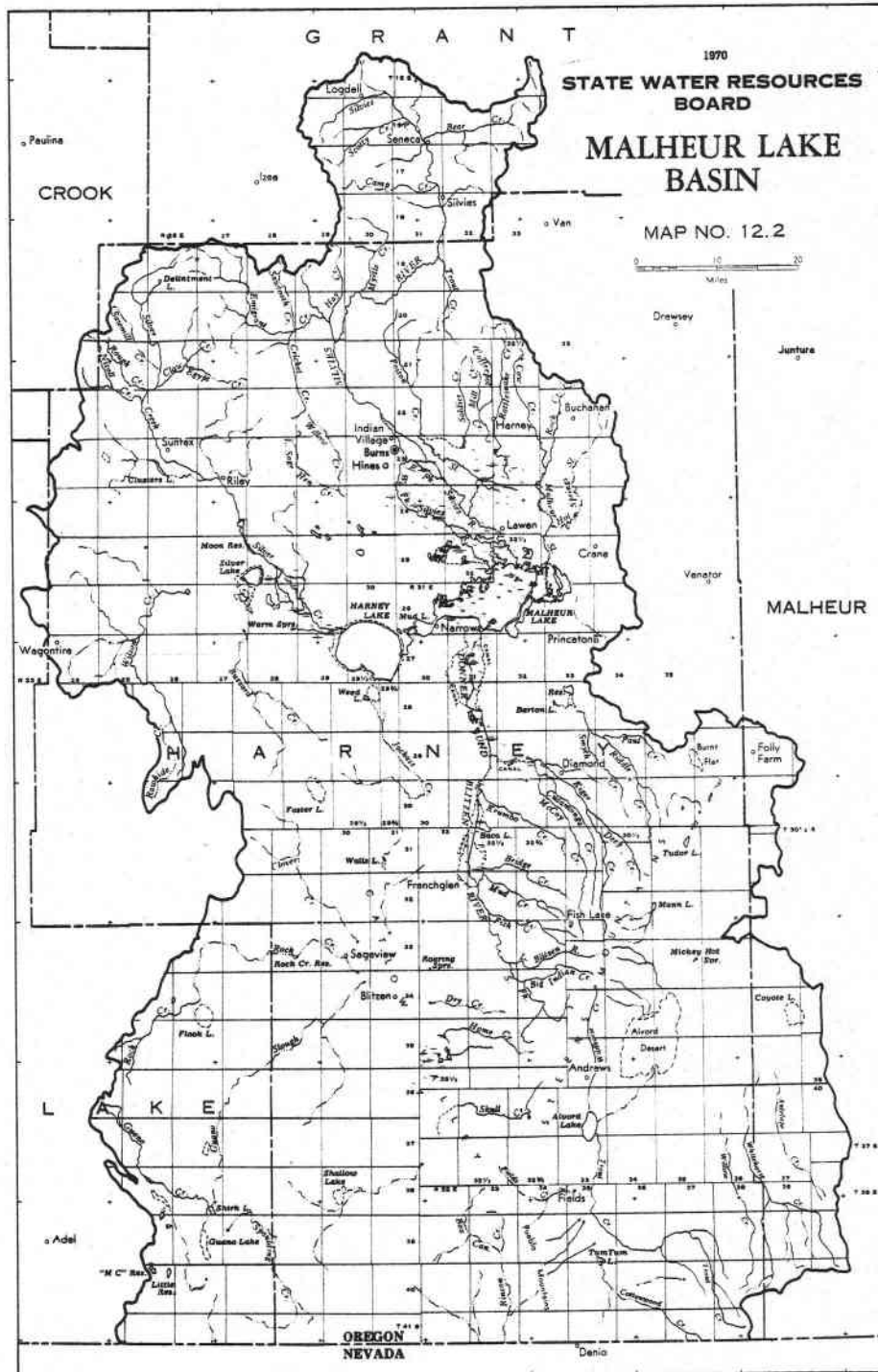
APPENDIX 12: MALHEUR LAKE BASIN



WATER RESOURCES RESEARCH INSTITUTE
Oregon State University
Corvallis, Oregon 97331

INDEX TO APPENDIX 12, MALHEUR LAKE BASIN

Drainage Basin Map	12-ii
Reach Hydro Potential Characteristics Sheets	
Silvies River	12-1 to 12-4
Donner und Blitzen River	12-5 to 12-8
Reach Feasibility Analysis Sheets	12-9



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-001-000-R0001

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 36, T24S, R31E.
D. Latitude, Longitude	43°26'N, 118°56'W
E. Stream Name	West Fork Silvies River
F. Major Basin Name	Malheur Lake Basin
G. River Mile	0.0 to 30.0

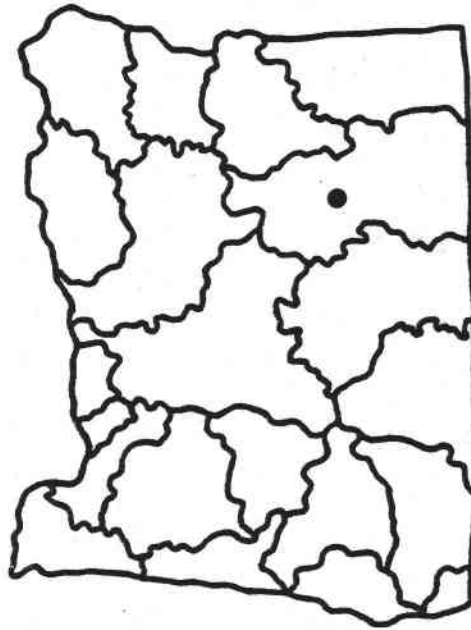
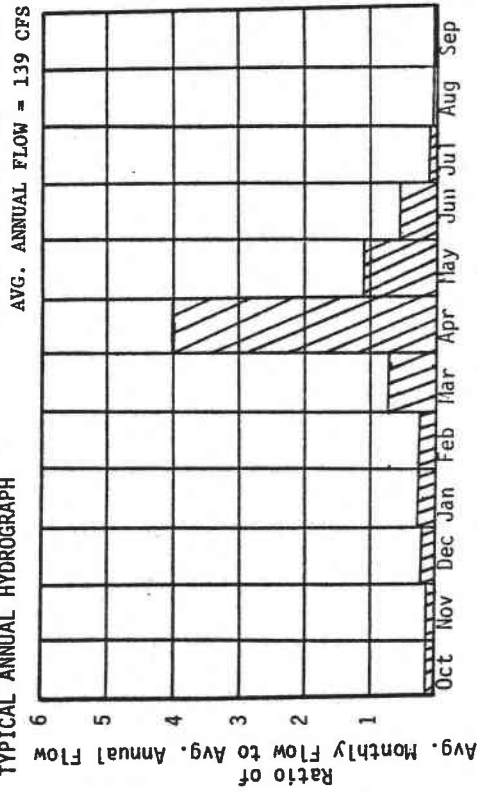
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	4145	Ft. MSL
B. Downstream Elevation of Reach	4107	Ft. MSL
C. Total Available Head in Reach	38	Ft.
D. Average Slope in Reach	1.3	Ft./Mi.
E. Drainage Area above Reach Mouth	1232	Sq. Mi.
F. Inflow Classification	Natural	

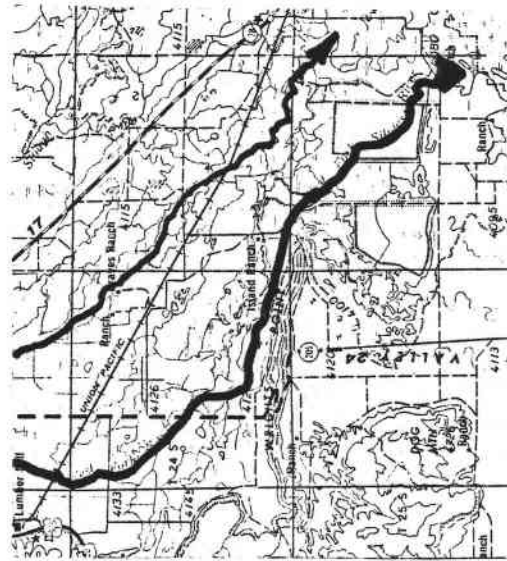
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

I	PERCENTAGE	I	DISCHARGE	I	THEORETICAL	I	ANNUAL ENERGY	I	PLANT
I	I	I	CFS	I	PLANT SIZE	I	AVAILABLE	I	FACTOR
I	I	I	I	I	MW	I	I	I	I
I	95	I	5.2	I	.02	I	.15	I	1.000
I	80	I	13.5	I	.04	I	.35	I	.924
I	50	I	37.9	I	.12	I	.80	I	.747
I	30	I	88.1	I	.28	I	1.37	I	.549
I	10	I	375.7	I	1.21	I	2.99	I	.282

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: BURNS



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-001-000-R0002

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 25, T22S, R30E
D. Latitude, Longitude	43°38'N, 119°06'W
E. Stream Name	Silvies River
F. Major Basin Name	Malheur Lake Basin
G. River Mile	0.0 to 19.0

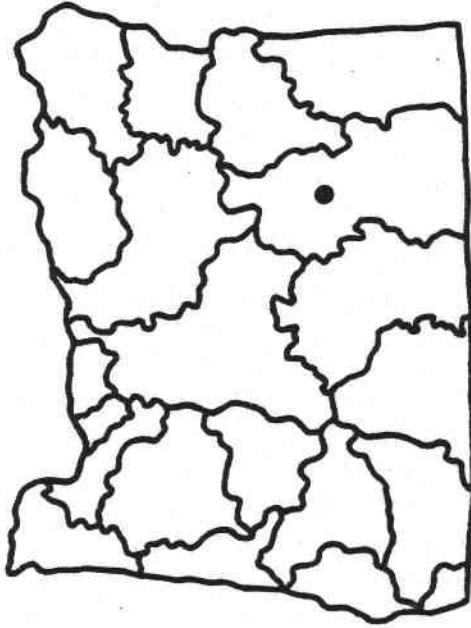
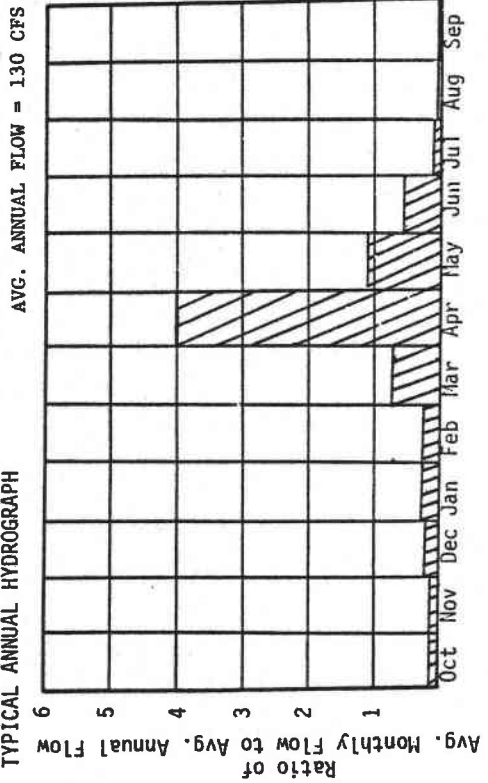
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	4180	Ft. MSL
B. Downstream Elevation of Reach	4145	Ft. MSL
C. Total Available Head in Reach	35	Ft.
D. Average Slope in Reach	1.8	Ft./Mi.
E. Drainage Area above Reach Mouth	483	Sq. Mi.
F. Inflow Classification	Natural	

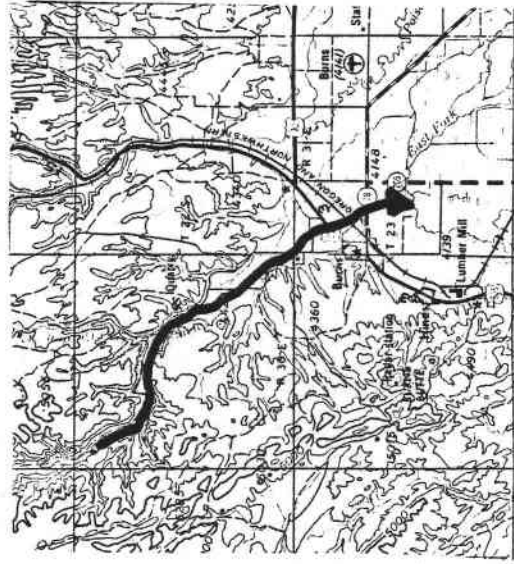
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS	I THEORETICAL I PLANT SIZE I MW	I ANNUAL ENERGY I AVAILABLE I GWH	I PLANT I FACTOR I
I 95 I	I 5.2 I	I .02 I	I .13 I	I 1.000 I
I 80 I	I 13.1 I	I .04 I	I .31 I	I .924 I
I 50 I	I 36.3 I	I .11 I	I .71 I	I .749 I
I 30 I	I 83.3 I	I .25 I	I 1.19 I	I .552 I
I 10 I	I 349.4 I	I 1.04 I	I 2.58 I	I .284 I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: BURNS



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-001-000-R0003

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 24, T21S, R29E
D. Latitude, Longitude	43°43'N, 119°11'W
E. Stream Name	Silvies River
F. Major Basin Name	Malheur Lake Basin
G. River Mile	19.0 to 29.0

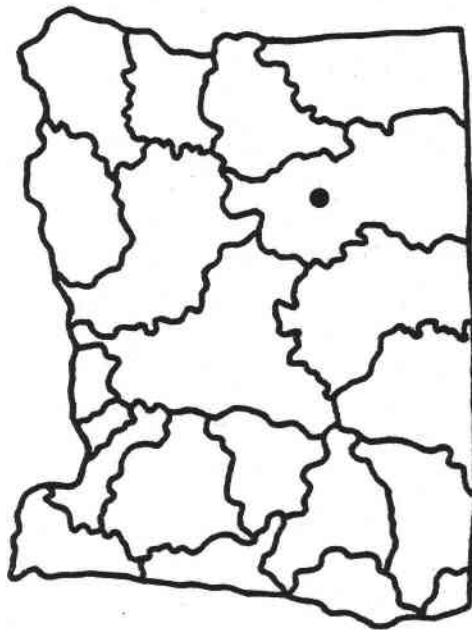
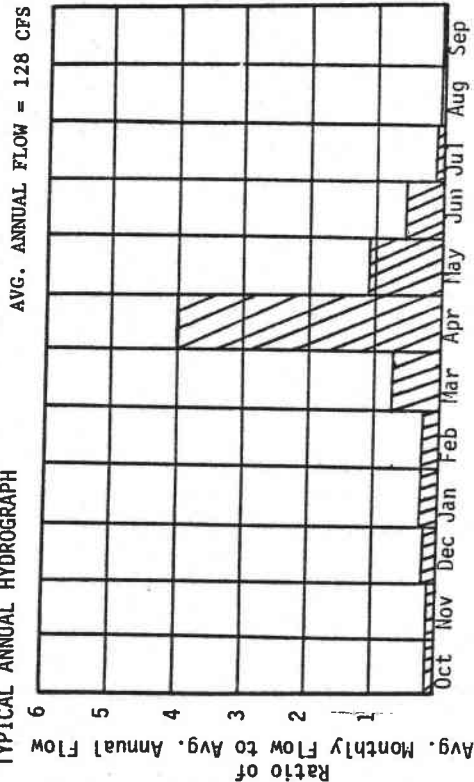
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	4260	Ft. MSL
B. Downstream Elevation of Reach	4180	Ft. MSL
C. Total Available Head in Reach	80	Ft.
D. Average Slope in Reach	8	Ft./Mi.
E. Drainage Area above Reach Mouth	937	Sq. Mi.
F. Inflow Classification	Natural	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS I	I THEORETICAL I PLANT SIZE I MW I	I ANNUAL ENERGY I AVAILABLE I GWH I	I PLANT I FACTOR I
I 95 I	I 5.1 I	I .03 I	I .31 I	I 1.000 I
I 80 I	I 13.0 I	I .09 I	I .71 I	I .924 I
I 50 I	I 35.8 I	I .24 I	I 1.59 I	I .750 I
I 30 I	I 81.9 I	I .56 I	I 2.69 I	I .553 I
I 10 I	I 342.3 I	I 2.32 I	I 5.78 I	I .284 I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: BURNS



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-001-000-R0004

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 2, T21S, R29E
D. Latitude, Longitude	43°46'N, 119°14'W
E. Stream Name	Silvies River
F. Major Basin Name	Malheur Lake Basin
G. River Mile	29.0 to H.W.

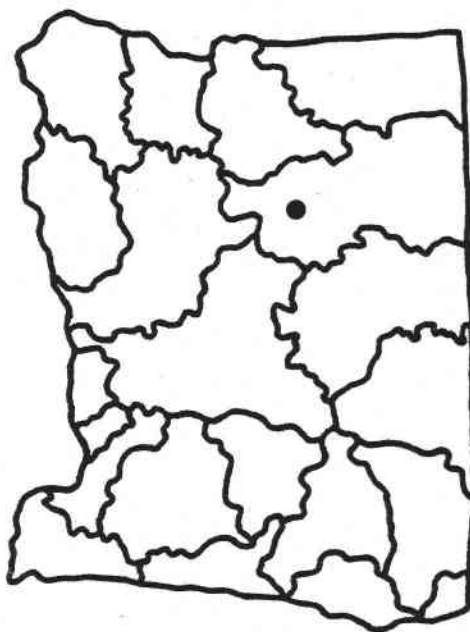
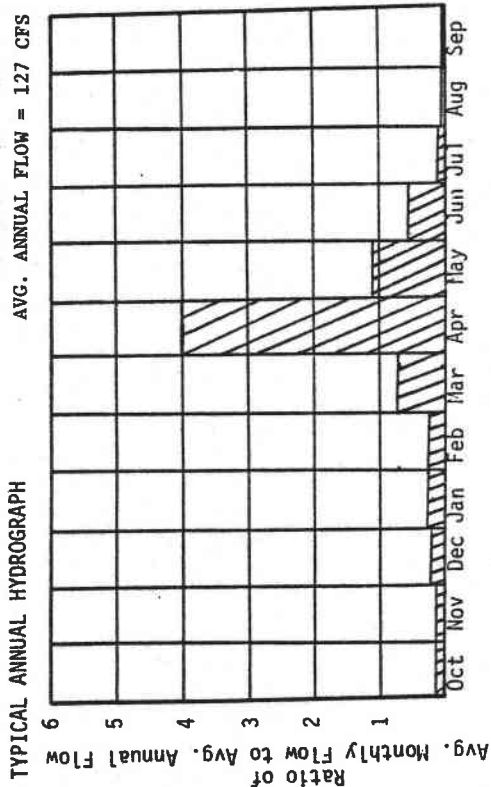
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	---	Ft. MSL
B. Downstream Elevation of Reach	---	Ft. MSL
C. Total Available Head in Reach	66	Ft.
D. Average Slope in Reach	---	Ft./Mi.
E. Drainage Area above Reach Mouth	913	Sq. Mi.
F. Inflow Classification	Natural	

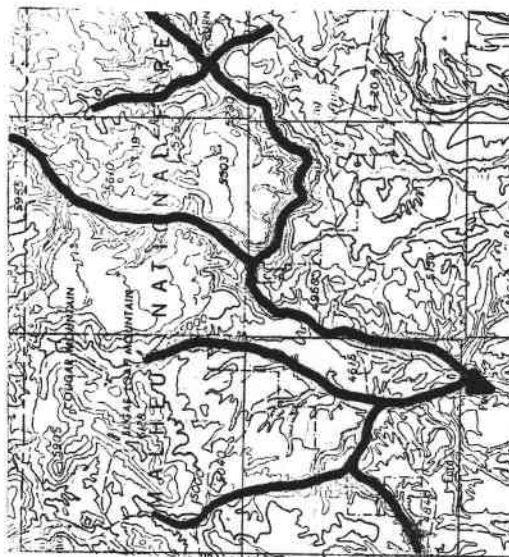
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS I	I THEORETICAL I PLANT SIZE I MW I	I ANNUAL ENERGY I AVAILABLE I GWH I	I PLANT I FACTOR I
I 95 I	I 5.1 I	I .03 I	I .25 I	I 1.000 I
I 80 I	I 13.0 I	I .07 I	I .59 I	I .924 I
I 50 I	I 35.6 I	I .20 I	I 1.31 I	I .750 I
I 30 I	I 81.5 I	I .46 I	I 2.21 I	I .553 I
I 10 I	I 340.0 I	I 1.90 I	I 4.74 I	I .285 I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: BURNS



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-002-000-R0001

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 33, T27S, R31E
D. Latitude, Longitude	43°11'N, 118°55'W
E. Stream Name	Donner und Blitzen River
F. Major Basin Name	Malheur Lake
G. River Mile	3.0 to 20.0

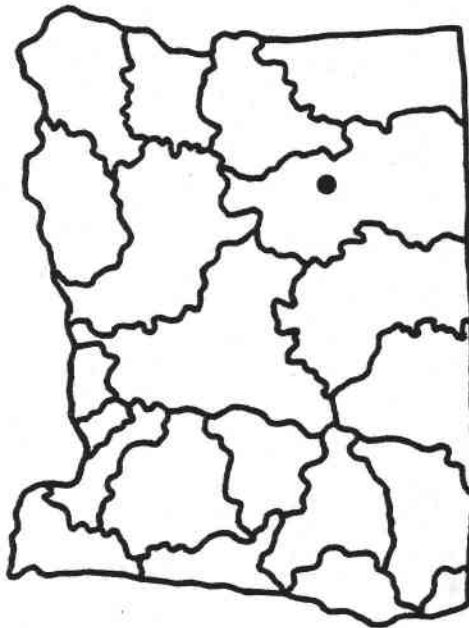
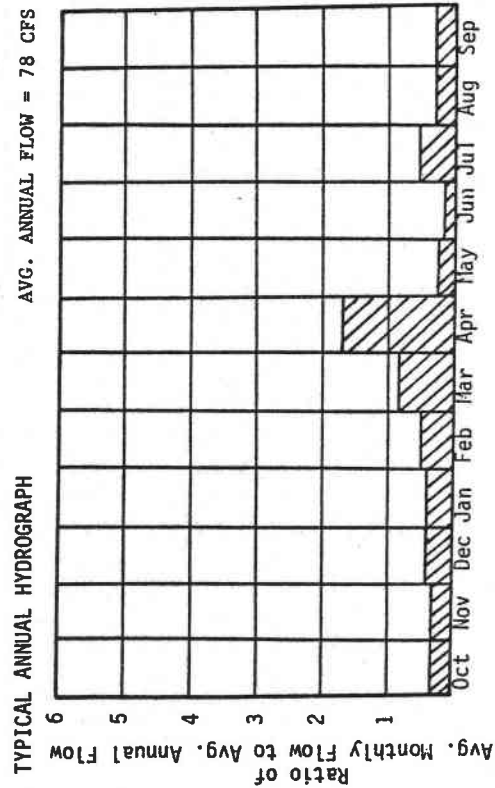
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach	4130	Ft. MSL
B. Downstream Elevation of Reach	4100	Ft. MSL
C. Total Available Head in Reach	30	Ft.
D. Average Slope in Reach	1.8	Ft./Mi.
E. Drainage Area above Reach Mouth	743	Sq. Mi.
F. Inflow Classification	Natural	

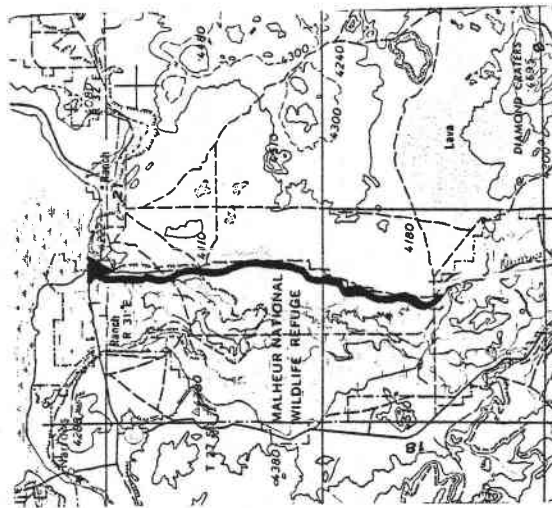
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS I	I THEORETICAL I PLANT SIZE I MW I	I ANNUAL ENERGY I AVAILABLE I GWH I	I PLANT I FACTOR I
I 95 I	I 4.6 I	I .01 I	I .10 I	I 1.000 I
I 80 I	I 10.6 I	I .03 I	I .22 I	I .929 I
I 50 I	I 25.4 I	I .06 I	I .43 I	I .767 I
I 30 I	I 53.4 I	I .14 I	I .68 I	I .574 I
I 10 I	I 198.2 I	I .50 I	I 1.33 I	I .301 I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: BURNS



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-002-000-R0002

I. LOCATION

A. State Oregon
 B. County Harney
 C. Township, Range Sec. 23, T29S, R31E
 D. Latitude, Longitude 43°02'N, 118°30'W
 E. Stream Name Donner und Blitzen River
 F. Major Basin Name Malheur Lake
 G. River Mile 20.0 to 33.0

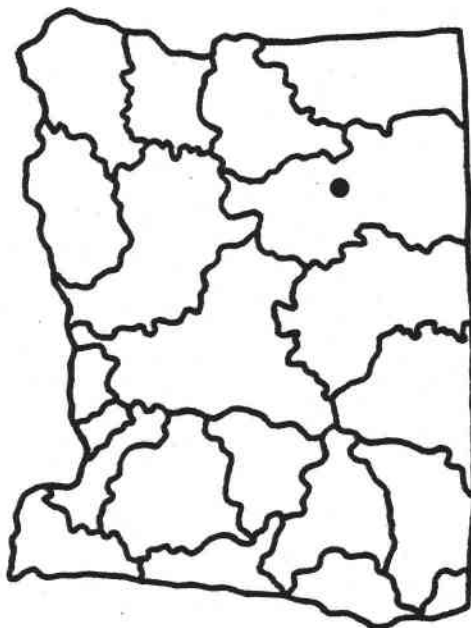
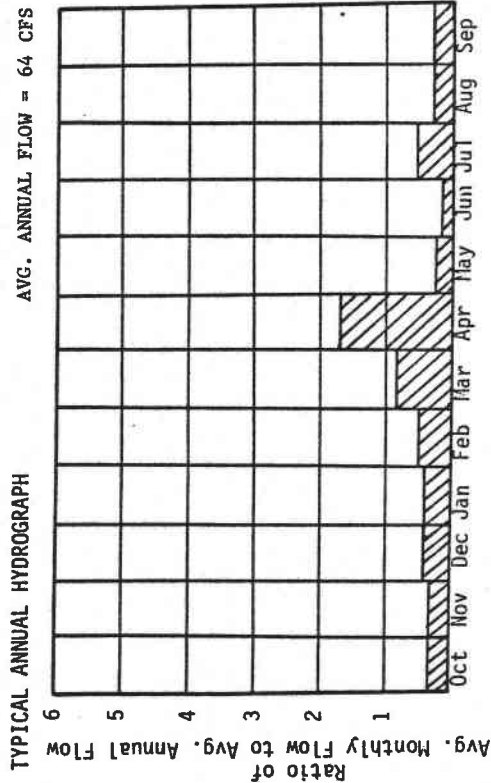
II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

A. Upstream Elevation of Reach 4151 Ft. MSL
 B. Downstream Elevation of Reach 4130 Ft. MSL
 C. Total Available Head in Reach 21 Ft.
 D. Average Slope in Reach 1.6 Ft./Mi.
 E. Drainage Area above Reach Mouth 673 Sq. Mi.
 F. Inflow Classification Natural

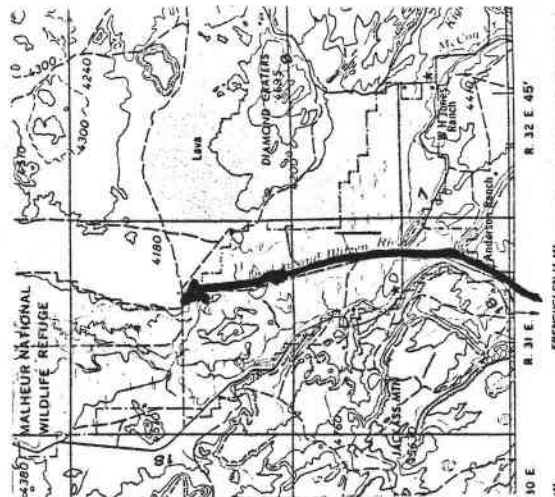
III. REACH FLOW DURATION AND THEORETICAL POTENTIAL

PERCENTAGE EXCEEDANCE									
I	I	I	I	I	I	I	I	I	I
PERCENTAGE	DISCHARGE	THEORETICAL	PLANT SIZE	ANNUAL ENERGY	PLANT	AVAILABLE	FACTOR	FACTOR	FACTOR
I	CFS	I	I	I	I	I	I	I	I
95	4.4	.01	.07	1.000	I	.07	I	1.000	I
80	9.8	.02	.14	.932	I	.14	I	.932	I
50	22.0	.04	.27	.775	I	.27	I	.775	I
30	44.8	.08	.41	.584	I	.41	I	.584	I
10	158.3	.28	.76	.309	I	.76	I	.309	I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
 1:250,000 SCALE
 MAP NAME: BURNS-ADEL



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-002-000-R0003

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 25, T31S, R32E
D. Latitude, Longitude	42° 51' N, 118° 30' W
E. Stream Name	Donner und Blitzen
F. Major Basin Name	Malheur Lake
G. River Mile	33.0 to 49.0

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

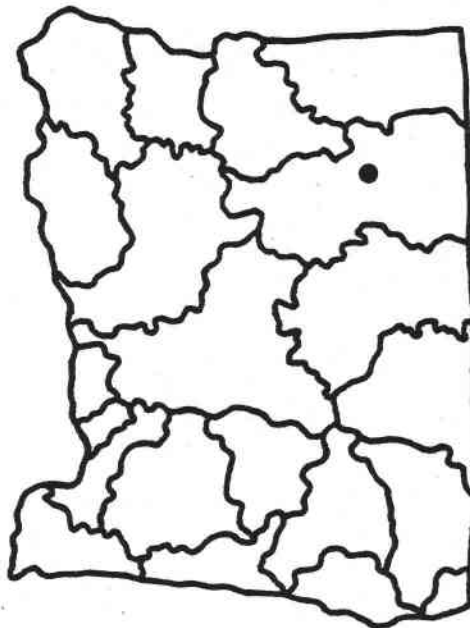
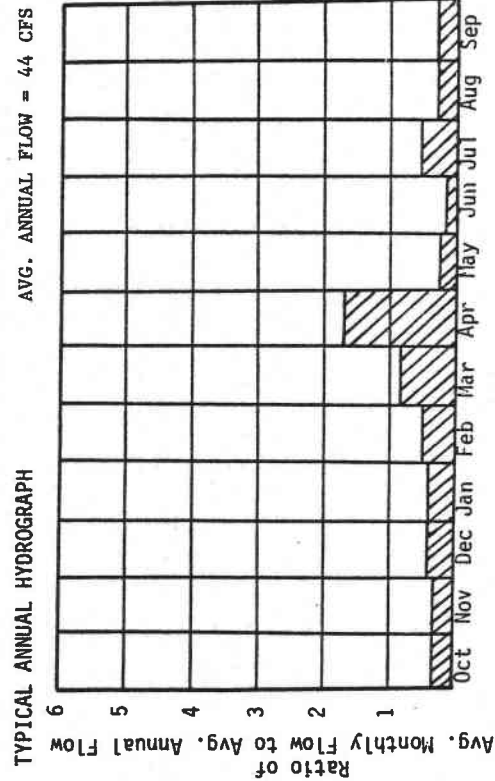
A. Upstream Elevation of Reach	4362	Ft. MSL
B. Downstream Elevation of Reach	4151	Ft. MSL
C. Total Available Head in Reach	211	Ft.
D. Average Slope in Reach	13.2	Ft./Mi.
E. Drainage Area above Reach Mouth	351	Sq. Mi.
F. Inflow Classification	Natural	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL

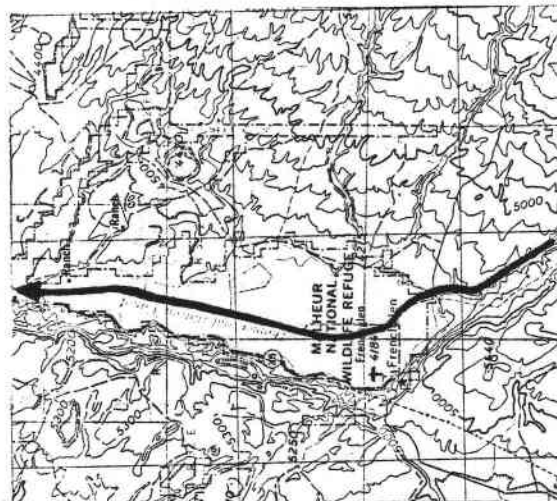
ENERGY CHARACTERISTICS

I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS I	I THEORETICAL I PLANT SIZE I MW I	I ANNUAL ENERGY I AVAILABLE I GWH I	I PLANT I FACTOR I
I 95 I	I 4.1 I	I .07 I	I .64 I	I 1.000 I
I 80 I	I 8.4 I	I .15 I	I 1.23 I	I .936 I
I 50 I	I 16.9 I	I .30 I	I 2.10 I	I .791 I
I 30 I	I 32.3 I	I .58 I	I 3.06 I	I .605 I
I 10 I	I 104.3 I	I 1.86 I	I 5.31 I	I .325 I

IV. TYPICAL ANNUAL HYDROGRAPH



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: ADEL



REACH HYDRO POTENTIAL CHARACTERISTICS

REACH # 02-000-012-002-000-R0004

I. LOCATION

A. State	Oregon
B. County	Harney
C. Township, Range	Sec. 28, T32S, R32E
D. Latitude, Longitude	42°45'N, 118°30'W
E. Stream Name	Donner und Blitzen River
F. Major Basin Name	Malheur Lake
G. River Mile	49.0 to H.W.

II. HYDROLOGIC AND HYDRAULIC CHARACTERISTICS

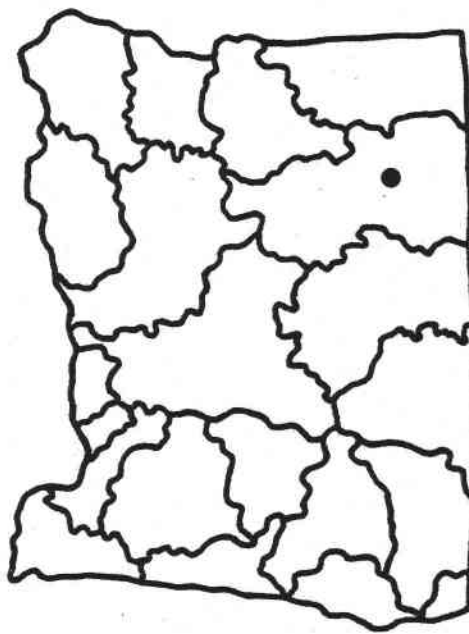
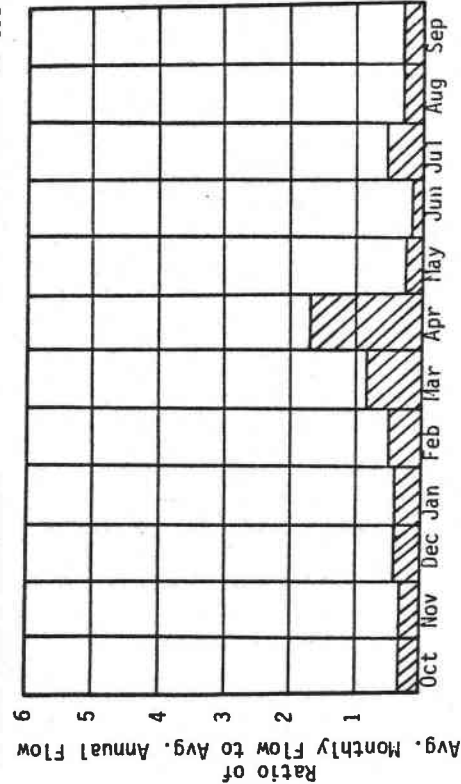
A. Upstream Elevation of Reach	---	Ft. MSL
B. Downstream Elevation of Reach	---	Ft. MSL
C. Total Available Head in Reach	66	Ft.
D. Average Slope in Reach	---	Ft./Mi.
E. Drainage Area above Reach Mouth	190	Sq. Mi.
F. Inflow Classification	Natural	

III. REACH FLOW DURATION AND THEORETICAL POTENTIAL ENERGY CHARACTERISTICS

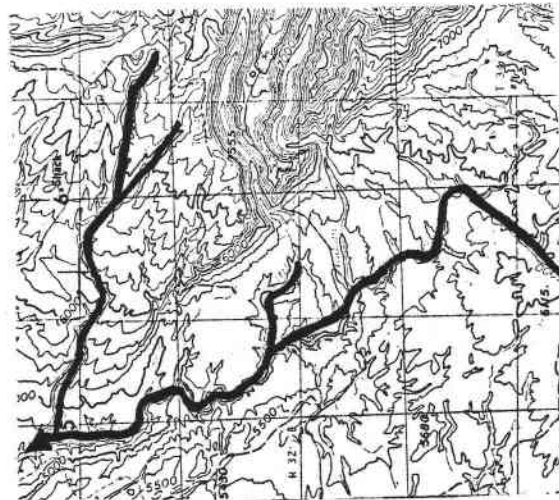
I EXCEEDANCE I PERCENTAGE I	I DISCHARGE I CFS I	I THEORETICAL I PLANT SIZE I MW I	I ANNUAL ENERGY I AVAILABLE I GWH I	I PLANT I FACTOR I
I 95 I	I 3.9 I	I .02 I	I .19 I	I 1.000 I
I 80 I	I 7.7 I	I .04 I	I .35 I	I .938 I
I 50 I	I 14.8 I	I .08 I	I .58 I	I .801 I
I 30 I	I 27.2 I	I .15 I	I .82 I	I .617 I
I 10 I	I 83.8 I	I .47 I	I 1.38 I	I .335 I

IV. TYPICAL ANNUAL HYDROGRAPH

AVG. ANNUAL FLOW = 36 CFS



U.S.G.S. TOPO. SERIES
1:250,000 SCALE
MAP NAME: ADEL



FEASIBILITY, TRANSMISSION AND LOAD RESTRAINTS

REACH IDENTIFICATION NUMBER	FEASIBILITY RESTRAINT				TRANSMISSION AND LOAD CONSIDERATIONS			
	LAND USE RESTRICTIONS	UTILITY DISPLACEMENT	BUILDING DISPLACEMENT	SPECIAL FISH PROBLEMS	DISTANCE TO NEAREST LINE Miles	LINE CAPACITY KVA	LOCAL MARKET	DISTANCE TO CITY >1000 Miles
02-000-012								
002-000-R0001	X	-	-	-	6.0	115 H-C	-	58.0
002-000-R0002	X	X	-	-	1.5	115 H-C	-	49.0
002-000-R0003	-	-	-	-	1.0	115 H-C	-	40.0
002-000-R0004	-	-	-	-	4.8	115 H-C	-	29.0
001-000-R0001	-	-	-	-	3.5	115 H-C	-	11.0
001-000-R0002	-	X	X	-	1.0	138 CPU	1	3.5
001-000-R0003	-	-	-	-	7.5	138 CPU	-	12.0
001-000-R0004	-	-	-	-	9.0	138 CPU	-	16.0