APPENDIX D

ECONOMIC ANALYSIS

Ayres, Lewis, Norris & May, Inc.
Engineers · Architects · Planners
3983 Research Park Drive
Ann Arbor, Michigan 48104

April 24, 1981

MEMORANDUM

TO: Robert Barnes

FROM: Gary Green

RE: Status of Corunna Hydro Feasibility Study

Four different design alternatives were evaluated to determine estimated project cost and annual project energy production for the Corunna Dam hydro site. The best or most cost effective alternative turned out to be a single bulb type turbine-generator unit with a capacity of 70 kw and an annual energy production of 367,920 kwh. The first year cost of production, including debt amortization and O&M expense, was 7.9¢/kwh. The total project cost was $190,000. Financing was assumed to be with general obligation bonds at 10.5% for 24 years. Operation and maintenance was calculated as 2% of equipment costs plus 1/4 of a man year at $20,000/year for a total of $7,000. This does not include general dam maintenance and repair. It only applies to the hydroelectric equipment. This may not be a valid assumption if the City of Corunna has the option of demolishing the dam or simply allowing it to deteriorate.

Table 1 attached shows a cash flow analysis of the project with power sold to Consumers Power at the avoided cost rate. Renvenue is escalated at 8% per year, while O&M costs are escalated at 6% per year. The project shows 19 years of negative cash flow with a net loss of $194,597 after the 24 year bond life.

Table 2 shows a cash flow model based on a long term fixed price power purchase agreement and a longer term g.o. bond issue. The bonds assumed are 30 year, 11%. The selling price is 12¢/kwh for 30 years. The 30 year net cash flow is a $115,601 surplus. However, the last 8 years of operation would have negative cash flow. It seems unlikely that a power purchase agreement like this could be negotiated. The selling price is so high the purchaser wouldn't reach the breakeven point for 20 years.

For these reasons, the project is not felt to be economically or financially feasible.

TABLE 1

CORUNNA BEST ALTERNATIVE
SINGLE 70 KW ESSEX UNIT
(BASED ON SELLING POWER TO CONSUMERS POWER AT RATE
OF 2.8¢/KWH. REVENUE ESCALATED AT 8% ANNUALLY)

CASH FLOW STATEMENT

YEAR OF OPERATION	DEBT AMORTIZATION	OPERATION AND MAINTENANCE	TOTAL ANNUAL COST	AVERAGE ANNUAL ENERGY PRODUCTION KWH	VALUE OF ENERGY DOLLARS/KWH	GROSS PROJECT REVENUE	NET PROJECT REVENUE
1	$ 21945.	$ 7000.	$ 28945.	367920.	$0.028	$ 10302.	$ -18643.
2	$ 21945.	$ 7420.	$ 29365.	367920.	$0.030	$ 11126.	$ -18239.
3	$ 21945.	$ 7865.	$ 29810.	367920.	$0.033	$ 12016.	$ -17794.
4	$ 21945.	$ 8337.	$ 30282.	367920.	$0.035	$ 12977.	$ -17305.
5	$ 21945.	$ 8837.	$ 30782.	367920.	$0.038	$ 14015.	$ -16767.
6	$ 21945.	$ 9368.	$ 31313.	367920.	$0.041	$ 15137.	$ -16176.
7	$ 21945.	$ 9930.	$ 31875.	367920.	$0.044	$ 16348.	$ -15527.
8	$ 21945.	$ 10525.	$ 32470.	367920.	$0.048	$ 17655.	$ -14815.
9	$ 21945.	$ 11157.	$ 33102.	367920.	$0.052	$ 19068.	$ -14034.
10	$ 21945.	$ 11826.	$ 33771.	367920.	$0.056	$ 20593.	$ -13178.
11	$ 21945.	$ 12536.	$ 34481.	367920.	$0.060	$ 22241.	$ -12240.
12	$ 21945.	$ 13288.	$ 35233.	367920.	$0.065	$ 24020.	$ -11213.
13	$ 21945.	$ 14085.	$ 36030.	367920.	$0.070	$ 25942.	$ -10089.
14	$ 21945.	$ 14931.	$ 36876.	367920.	$0.076	$ 28017.	$ -8859.
15	$ 21945.	$ 15826.	$ 37771.	367920.	$0.082	$ 30258.	$ -7513.
16	$ 21945.	$ 16776.	$ 38721.	367920.	$0.088	$ 32679.	$ -6042.
17	$ 21945.	$ 17783.	$ 39728.	367920.	$0.095	$ 35293.	$ -4434.
18	$ 21945.	$ 18850.	$ 40795.	367920.	$0.104	$ 38117.	$ -2678.
19	$ 21945.	$ 19981.	$ 41926.	367920.	$0.112	$ 41166.	$ -760.
20	$ 21945.	$ 21179.	$ 43124.	367920.	$0.121	$ 44459.	$ 1335.
21	$ 21945.	$ 22450.	$ 44395.	367920.	$0.131	$ 48016.	$ 3621.
22	$ 21945.	$ 23797.	$ 45742.	367920.	$0.141	$ 51857.	$ 6115.
23	$ 21945.	$ 25225.	$ 47170.	367920.	$0.152	$ 56006.	$ 8836.
24	$ 21945.	$ 26738.	$ 48683.	367920.	$0.164	$ 60486.	$ 11803.
	$ 526680.	$ 355711.	$ 882391.	8830080.		$ 687794.	$ -194597.

CASH FLOW STATEMENT

YEAR OF OPERATION	DEBT AMORTIZATION	OPERATION AND MAINTENANCE	TOTAL ANNUAL COST	AVERAGE ANNUAL ENERGY PRODUCTION KWH	VALUE OF ENERGY DOLLARS/KWH	GROSS PROJECT REVENUE	NET PROJECT REVENUE
1	$ 21850.	$ 7000.	$ 28850.	367920.	$0.120	$ 44150.	$ 15300.
2	$ 21850.	$ 7420.	$ 29270.	367920.	$0.120	$ 44150.	$ 14880.
3	$ 21850.	$ 7865.	$ 29715.	367920.	$0.120	$ 44150.	$ 14435.
4	$ 21850.	$ 8337.	$ 30187.	367920.	$0.120	$ 44150.	$ 13963.
5	$ 21850.	$ 8837.	$ 30687.	367920.	$0.120	$ 44150.	$ 13463.
6	$ 21850.	$ 9368.	$ 31218.	367920.	$0.120	$ 44150.	$ 12933.
7	$ 21850.	$ 9930.	$ 31780.	367920.	$0.120	$ 44150.	$ 12371.
8	$ 21850.	$ 10525.	$ 32375.	367920.	$0.120	$ 44150.	$ 11775.
9	$ 21850.	$ 11157.	$ 33007.	367920.	$0.120	$ 44150.	$ 11143.
10	$ 21850.	$ 11826.	$ 33676.	367920.	$0.120	$ 44150.	$ 10474.
11	$ 21850.	$ 12536.	$ 34386.	367920.	$0.120	$ 44150.	$ 9764.
12	$ 21850.	$ 13288.	$ 35138.	367920.	$0.120	$ 44150.	$ 9012.
13	$ 21850.	$ 14085.	$ 35935.	367920.	$0.120	$ 44150.	$ 8215.
14	$ 21850.	$ 14931.	$ 36781.	367920.	$0.120	$ 44150.	$ 7370.
15	$ 21850.	$ 15826.	$ 37676.	367920.	$0.120	$ 44150.	$ 6474.
16	$ 21850.	$ 16776.	$ 38626.	367920.	$0.120	$ 44150.	$ 5524.
17	$ 21850.	$ 17783.	$ 39633.	367920.	$0.120	$ 44150.	$ 4518.
18	$ 21850.	$ 18850.	$ 40700.	367920.	$0.120	$ 44150.	$ 3451.
19	$ 21850.	$ 19981.	$ 41831.	367920.	$0.120	$ 44150.	$ 2320.
20	$ 21850.	$ 21179.	$ 43029.	367920.	$0.120	$ 44150.	$ 1121.
21	$ 21850.	$ 22450.	$ 44300.	367920.	$0.120	$ 44150.	$ -150.
22	$ 21850.	$ 23797.	$ 45647.	367920.	$0.120	$ 44150.	$ -1497.
23	$ 21850.	$ 25225.	$ 47075.	367920.	$0.120	$ 44150.	$ -2925.
24	$ 21850.	$ 26738.	$ 48588.	367920.	$0.120	$ 44150.	$ -4438.
25	$ 21850.	$ 28343.	$ 50193.	367920.	$0.120	$ 44150.	$ -6042.
26	$ 21850.	$ 30043.	$ 51893.	367920.	$0.120	$ 44150.	$ -7743.
27	$ 21850.	$ 31846.	$ 53696.	367920.	$0.120	$ 44150.	$ -9546.
28	$ 21850.	$ 33757.	$ 55607.	367920.	$0.120	$ 44150.	$ -11456.
29	$ 21850.	$ 35782.	$ 57632.	367920.	$0.120	$ 44150.	$ -13482.
30	$ 21850.	$ 37929.	$ 59779.	367920.	$0.120	$ 44150.	$ -15629.
	$ 655500.	$ 553411.	$ 1208911.	11037600.		$ 1324509.	$ 115601.

TABLE 2

CORUNNA BEST ALTERNATIVE
SINGLE 70 KW ESSEX UNIT
(LONG TERM FIXED SELLING PRICE OF 12¢/KWH).