

APPENDIX TO SECTION 4.0

**POWER
STUDIES**

ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

POWER RELEASE IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	AVEYR	CALYR
1	3673.	3567.	3266.	2903.	2636.	2550.	2429.	2478.	2725.	3146.	3798.	4187.	3113.	1960
2	3939.	3828.	3384.	3111.	2821.	2726.	2507.	2479.	2725.	3146.	3798.	4187.	3221.	1961
3	3939.	3828.	3384.	3111.	2923.	2727.	2507.	2479.	2725.	3146.	3798.	4183.	3229.	1962
4	3939.	3831.	3508.	3111.	2924.	2825.	2590.	2556.	2725.	3146.	3798.	4187.	3262.	1963
5	3939.	3828.	3384.	3111.	2821.	2727.	2590.	2556.	2725.	3146.	3798.	4187.	3234.	1964
6	3939.	3831.	3508.	3111.	2924.	2825.	2680.	2638.	2725.	3146.	3798.	4187.	3276.	1965
7	3939.	3831.	3508.	3111.	2923.	2727.	2590.	2556.	2725.	3146.	3798.	4187.	3253.	1966
8	3939.	3828.	3381.	3111.	2821.	2726.	2507.	2479.	2725.	3146.	3798.	4187.	3221.	1967
9	3939.	3828.	3384.	3111.	2821.	2726.	2507.	2479.	2725.	3146.	3800.	4343.	3234.	1968
10	3939.	3831.	3508.	3111.	2924.	2727.	2507.	2555.	2725.	3146.	3670.	4187.	3236.	1969
11	3936.	3828.	3384.	3111.	2821.	2726.	2507.	2556.	2725.	3248.	3800.	4343.	3249.	1970
MEAN	3914.	3806.	3418.	3092.	2851.	2728.	2538.	2528.	2725.	3156.	3787.	4215.	3230.	
MAX	3939.	3831.	3508.	3111.	2924.	2825.	2680.	2638.	2725.	3248.	3800.	4343.	3276.	
MIN	3673.	3567.	3266.	2903.	2636.	2550.	2429.	2478.	2725.	3146.	3670.	4183.	3113.	

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ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

INFLOWS TO THE LAKE IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	AVEYR	CALYR
1	400.	307.	267.	393.	3637.	6837.	11209.	9337.	3145.	1439.	799.	870.	3220.	1960
2	877.	589.	470.	346.	1881.	7983.	12808.	10899.	6225.	1586.	843.	696.	3767.	1961
3	633.	541.	471.	470.	1265.	7925.	13149.	10411.	5542.	1197.	863.	613.	3590.	1962
4	498.	357.	315.	337.	1801.	4735.	13249.	12208.	5847.	2056.	930.	710.	3587.	1963
5	364.	435.	332.	477.	1830.	8093.	10700.	11798.	4246.	1245.	909.	662.	3424.	1964
6	419.	219.	337.	398.	1286.	3490.	13046.	10516.	10802.	2114.	597.	466.	3641.	1965
7	388.	336.	350.	410.	1893.	8072.	10303.	9974.	6608.	1953.	910.	313.	3459.	1966
8	531.	449.	384.	880.	2030.	8761.	14931.	15695.	6191.	2040.	1215.	571.	4473.	1967
9	534.	510.	467.	630.	2996.	7808.	13117.	11257.	2793.	976.	689.	612.	3532.	1968
10	485.	486.	500.	652.	1948.	9271.	12510.	7297.	2793.	3057.	1215.	541.	3396.	1969
11	497.	504.	550.	899.	2265.	6789.	10360.	7986.	2734.	1359.	742.	460.	2929.	1970
MEAN	511.	430.	404.	536.	2076.	7251.	12307.	10671.	5175.	1729.	883.	592.	3547.	
MAX	877.	589.	550.	899.	3637.	9271.	14931.	15695.	10802.	3057.	1215.	870.	4473.	
MIN	364.	219.	267.	337.	1265.	3490.	10303.	7297.	2734.	976.	597.	313.	2929.	

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ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

INSTALLED CAPACITY: 300000. KW

ANNUAL PLANT FACTOR: .5

OVERLOAD FACTOR: 1.00

PLANT EFFICIENCY: .850

FRICTION LOSS COEFFICIENT: .000002800

MONTHLY LOAD FACTORS:

.920 .870 .780 .700 .640 .620 .610 .640 .700 .800 .920 1.000

INITIAL LAKE STORAGE :4033200. AC-FT

MINIMUM LAKE STORAGE :2423600. AC-FT

MAXIMUM LAKE STORAGE :4033200. AC-FT

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SURPLUS ENERGY IN MWH

[illegible]

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AVERAGE GENERATION IN MW DURING SPILLS

[illegible]

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REMAINING SPILLS IN CFS

[illegible]

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

ENERGY IN MWH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTYR	CALYR
1	147312.	130318.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1448947.	1960
2	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1961
3	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1962
4	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1963
5	147312.	130318.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1448947.	1964
6	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1965
7	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1966
8	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1967
9	147312.	130318.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1448947.	1968
10	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1969
11	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	1970
MEAN	147312.	127050.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1445679.	
MAX	147312.	130318.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1448947.	
MIN	147312.	125825.	124895.	108470.	102478.	96073.	97674.	102478.	108470.	128097.	142560.	160122.	1444453.	

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

POWER IN MW

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVEYR	CALYR
1	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1960
2	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1961
3	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1962
4	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1963
5	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1964
6	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1965
7	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1966
8	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1967
9	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1968
10	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1969
11	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	1970
MEAN	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	
MAX	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	
MIN	198.	187.	168.	151.	138.	133.	131.	138.	151.	172.	198.	215.	165.	

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WATER BALANCE

[illegible]

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E.O.P. STORAGE IN ACRE-FT

ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVEYR	CALYR
1	3844486.	3672051.	3503609.	3357932.	3377054.	3590235.	4033200.	4033200.	4016273.	3517430.	3754049.	3571403.	3722577.	1960
2	3402437.	3239885.	3073650.	2920553.	2824773.	3099675.	3689300.	4033200.	4033200.	3943396.	3782633.	3589288.	3469332.	1961
3	3405319.	3240101.	3073928.	2920830.	2787174.	3058625.	3669218.	4033200.	4033200.	3519477.	3759904.	3561456.	3455203.	1962
4	3369186.	3154193.	3021502.	2868358.	2767700.	2849328.	3462870.	4012209.	4033200.	3572295.	3816709.	3624225.	3415984.	1963
5	3423797.	3246581.	3073891.	2920793.	2821878.	3103326.	3560138.	4033200.	4033200.	3522428.	3765593.	3570158.	3456249.	1964
6	3373030.	3198037.	3025346.	2872242.	2739877.	2743929.	3341621.	3783716.	4033200.	3975861.	3800460.	3592974.	3373358.	1965
7	3393940.	3218547.	3046256.	2893152.	2798110.	3078308.	3510710.	3922686.	4033200.	3965961.	3809186.	3595489.	3438829.	1966
8	3405247.	3234520.	3063397.	2910300.	2823682.	3144879.	3865042.	4033200.	4033200.	3971311.	3832684.	3631653.	3495793.	1967
9	3441617.	3273230.	3106810.	2953713.	2926492.	3194307.	3802931.	4033200.	3995328.	3868016.	3698073.	3494118.	3482320.	1968
10	3301049.	3132755.	2963905.	2810801.	2715398.	3066938.	3638240.	3885616.	3844473.	3841176.	3702533.	3494213.	3366425.	1969
11	3301881.	3134551.	2968811.	2815707.	2743549.	2947400.	3383303.	3669834.	3625181.	3513341.	3341792.	3122697.	3214007.	1970
MEAN	3423817.	3253208.	3083737.	2931311.	2847790.	3079723.	3632416.	3952114.	3973968.	3851881.	3733056.	3531607.	3444552.	
MAX	3844486.	3672051.	3503609.	3357932.	3377054.	3590235.	4033200.	4033200.	4033200.	3975861.	3832684.	3631653.	3722577.	
MIN	3301049.	3132755.	2963905.	2810801.	2715398.	2743929.	3341621.	3669834.	3625181.	3513341.	3341792.	3122697.	3214007.	

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NET EVAPORATION IN AC-FT

[illegible]

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

FISH RELEASE IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVEYR	CALYR
1	365.	307.	267.	393.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	658.	1960
2	365.	365.	365.	346.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	667.	1961
3	365.	365.	365.	470.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	677.	1962
4	365.	357.	315.	337.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	662.	1963
5	364.	365.	332.	477.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	675.	1964
6	365.	219.	337.	398.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	657.	1965
7	365.	336.	350.	410.	1094.	1094.	1094.	1094.	1094.	365.	365.	313.	664.	1966
8	365.	365.	365.	880.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	712.	1967
9	365.	365.	365.	630.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	691.	1968
10	365.	365.	365.	652.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	693.	1969
11	365.	365.	365.	899.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	713.	1970
MEAN	365.	343.	345.	536.	1094.	1094.	1094.	1094.	1094.	365.	365.	360.	679.	
MAX	365.	365.	365.	899.	1094.	1094.	1094.	1094.	1094.	365.	365.	365.	713.	
MIN	364.	219.	267.	337.	1094.	1094.	1094.	1094.	1094.	365.	365.	313.	657.	

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

SPILL IN CFS

[illegible]

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

POWER RELEASE IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVEYR	CALYR
1	3104.	2998.	2739.	2448.	2232.	2160.	2075.	2130.	2335.	2682.	3180.	3475.	2630.	1960
2	3260.	3151.	2809.	2573.	2345.	2269.	2125.	2130.	2335.	2682.	3180.	3475.	2694.	1961
3	3260.	3151.	2809.	2573.	2345.	2269.	2125.	2180.	2335.	2682.	3180.	3475.	2699.	1962
4	3260.	3151.	2809.	2573.	2345.	2269.	2177.	2180.	2335.	2682.	3180.	3475.	2703.	1963
5	3260.	3151.	2809.	2573.	2345.	2269.	2177.	2180.	2335.	2682.	3180.	3475.	2703.	1964
6	3260.	3151.	2809.	2573.	2345.	2328.	2231.	2232.	2336.	2682.	3180.	3475.	2717.	1965
7	3260.	3151.	2809.	2573.	2345.	2269.	2177.	2180.	2335.	2682.	3180.	3475.	2703.	1966
8	3260.	3151.	2809.	2573.	2345.	2269.	2125.	2130.	2335.	2682.	3180.	3475.	2694.	1967
9	3260.	3072.	2809.	2573.	2345.	2213.	2125.	2130.	2335.	2682.	3180.	3564.	2691.	1968
10	3260.	3151.	2881.	2573.	2406.	2269.	2125.	2180.	2390.	2746.	3180.	3564.	2727.	1969
11	3260.	3151.	2881.	2573.	2345.	2269.	2177.	2232.	2390.	2813.	3260.	3658.	2751.	1970
MEAN	3246.	3130.	2815.	2562.	2340.	2260.	2149.	2171.	2345.	2699.	3187.	3508.	2701.	
MAX	3260.	3151.	2881.	2573.	2406.	2328.	2231.	2232.	2390.	2813.	3260.	3658.	2751.	
MIN	3104.	2998.	2739.	2448.	2232.	2160.	2075.	2130.	2335.	2682.	3180.	3475.	2630.	

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

INFLOWS TO THE LAKE IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVEYR	CALYR
1	400.	307.	267.	393.	3637.	6837.	11209.	9337.	3145.	1439.	799.	870.	3220.	1960
2	877.	589.	470.	346.	1881.	7983.	12808.	10899.	6225.	1586.	843.	696.	3767.	1961
3	633.	541.	471.	470.	1265.	7925.	13149.	10411.	5542.	1197.	863.	613.	3590.	1962
4	498.	357.	315.	337.	1801.	4735.	13249.	12208.	5847.	2056.	930.	710.	3587.	1963
5	364.	435.	332.	477.	1830.	8093.	10700.	11798.	4246.	1245.	909.	662.	3424.	1964
6	419.	219.	337.	398.	1286.	3490.	13046.	10516.	10802.	2114.	597.	466.	3641.	1965
7	388.	336.	350.	410.	1893.	8072.	10303.	9974.	6608.	1953.	910.	313.	3459.	1966
8	531.	449.	384.	880.	2030.	8761.	14931.	15695.	6191.	2040.	1215.	571.	4473.	1967
9	534.	519.	467.	630.	2996.	7808.	13117.	11257.	2793.	976.	689.	612.	3532.	1968
10	485.	486.	500.	652.	1948.	9271.	12510.	7297.	2793.	3057.	1215.	541.	3396.	1969
11	497.	504.	550.	859.	2265.	6789.	10360.	7986.	2734.	1359.	742.	460.	2929.	1970
MEAN	511.	430.	404.	536.	2076.	7251.	12307.	10671.	5175.	1729.	883.	592.	3547.	
MAX	877.	589.	550.	899.	3637.	9271.	14931.	15695.	10802.	3057.	1215.	870.	4473.	
MIN	364.	219.	267.	337.	1265.	3490.	10303.	7297.	2734.	976.	597.	313.	2929.	

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

RESERVOIR STORAGE-ELEVATION-AREA:

AC-FT	FEET	ACRE
0.	760.	0.
2025.	765.	810.
7300.	770.	1300.
27200.	780.	2690.
111000.	800.	5670.
241000.	820.	7320.
397000.	840.	8270.
572000.	860.	9280.
769000.	880.	10400.
988000.	900.	11590.
1224000.	920.	11960.
1467000.	940.	12320.
1717000.	960.	12650.
1973000.	980.	12980.
2236000.	1000.	13280.
2504000.	1020.	13520.
2776000.	1040.	13740.
3053000.	1060.	13960.
3335000.	1080.	14170.
3620000.	1100.	14390.
3910000.	1120.	14620.
4033200.	1128.	15212.

TAILWATER-FLOW RELATIONSHIP:

FEET	CFS
210.	0.
210.	100000.

MONTHLY MINIMUM INSTREAM FLOWS IN CFS:

365. 365. 365. 1094. 1094. 1094. 1094. 1094. 1094. 365. 365. 365.

MONTHLY DIVERSION REQUIREMENTS IN CFS:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

MONTHLY RESERVOIR EVAPORATION IN INCHES:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

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ALTERNATIVE B: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

INSTALLED CAPACITY: 330000. KW

ANNUAL PLANT FACTOR: .5

OVERLOAD FACTOR: 1.00

PLANT EFFICIENCY: .850

FRICTION LOSS COEFFICIENT: .000002370

MONTHLY LOAD FACTORS:

.920 .870 .780 .700 .640 .620 .610 .640 .700 .800 .920 1.000

INITIAL LAKE STORAGE : 4033200. AC-FT

MINIMUM LAKE STORAGE : 0. AC-FT

MAXIMUM LAKE STORAGE : 4033200. AC-FT

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SURPLUS ENERGY IN MWH

[illegible]

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AVERAGE GENERATION IN MW DURING SPILLS

[illegible]

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REMAINING SPILLS IN CFS

[illegible]

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ALTERNATIVE A: MCARTIUR SHORT TUNNEL, W/O FISH RELEASES

ENERGY IN MWH

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTYR | CALYR |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|-------|
| 1 | 178560. | 157962. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1756299. | 1960 |
| 2 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1961 |
| 3 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1962 |
| 4 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1963 |
| 5 | 178560. | 157962. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1756299. | 1964 |
| 6 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1965 |
| 7 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1966 |
| 8 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1967 |
| 9 | 178560. | 157962. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1756299. | 1968 |
| 10 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1969 |
| 11 | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | 1970 |
| MEAN | 178560. | 154000. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1752338. | |
| MAX | 178560. | 157962. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1756299. | |
| MIN | 178560. | 152515. | 151388. | 131478. | 124216. | 116452. | 118393. | 124216. | 131478. | 155270. | 172800. | 194087. | 1750852. | |

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

POWER IN MW

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVEYR | CALYR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| 1 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1960 |
| 2 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1961 |
| 3 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1962 |
| 4 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1963 |
| 5 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1964 |
| 6 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1965 |
| 7 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1966 |
| 8 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1967 |
| 9 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1968 |
| 10 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1969 |
| 11 | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | 1970 |
| MEAN | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | |
| MAX | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | |
| MIN | 240. | 227. | 203. | 183. | 167. | 162. | 159. | 167. | 183. | 209. | 240. | 261. | 200. | |

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WATER BALANCE

[illegible]

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

E.O.P. STORAGE IN ACRE-FT

| YEAR | JAN | FFB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVEYR | CALYR |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------|
| 1 | 3823331. | 3629312. | 3439385. | 3284714. | 3336637. | 3586651. | 4033200. | 4033200. | 4033200. | 3919884. | 3734772. | 3524610. | 3698241. | 1960 |
| 2 | 3331718. | 3149100. | 2966291. | 2795474. | 2734289. | 3044413. | 3672605. | 4033200. | 4033200. | 3928923. | 3746429. | 3525568. | 3413767. | 1961 |
| 3 | 3317673. | 3132389. | 2943921. | 2784482. | 2681421. | 2988093. | 3633277. | 4033200. | 4033200. | 3905004. | 3723654. | 3490595. | 3388909. | 1962 |
| 4 | 3274399. | 3078897. | 2880837. | 2713484. | 2643365. | 2755850. | 3407174. | 3994312. | 4033200. | 3957822. | 3780505. | 3560504. | 3340029. | 1963 |
| 5 | 3336069. | 3138121. | 2941106. | 2782084. | 2713763. | 3030432. | 3525033. | 4033200. | 4033200. | 3907956. | 3729343. | 3499297. | 3389134. | 1964 |
| 6 | 3278243. | 3075077. | 2878370. | 2714647. | 2612861. | 2651264. | 3285913. | 3765014. | 4033200. | 3961388. | 3764256. | 3529253. | 3295790. | 1965 |
| 7 | 3306254. | 3109625. | 2913717. | 2750708. | 2686245. | 3001665. | 3471855. | 3921630. | 4033200. | 3951489. | 3772981. | 3528571. | 3370665. | 1966 |
| 8 | 3314404. | 3124011. | 2930194. | 2795151. | 2739128. | 3095546. | 3854284. | 4033200. | 4033200. | 3956838. | 3796480. | 3567933. | 3436697. | 1967 |
| 9 | 3353950. | 3160316. | 2977276. | 2827358. | 2835420. | 3135142. | 3782341. | 4033200. | 4029735. | 3887950. | 3696247. | 3463126. | 3431838. | 1968 |
| 10 | 3246131. | 3057793. | 2871108. | 2722499. | 2661418. | 3048183. | 3658052. | 3943232. | 3939767. | 3925938. | 3765579. | 3535188. | 3364574. | 1969 |
| 11 | 3318930. | 3131592. | 2947982. | 2814070. | 2777185. | 3016272. | 3489967. | 3817504. | 3806440. | 3683224. | 3488577. | 3246018. | 3294813. | 1970 |
| MEAN | 3354649. | 3162385. | 2971835. | 2817152. | 2765612. | 3032137. | 3619427. | 3967354. | 4003776. | 3907856. | 3727166. | 3497333. | 3402223. | |
| MAX | 3823331. | 3629312. | 3439385. | 3284714. | 3336637. | 3586651. | 4033200. | 4033200. | 4033200. | 3961388. | 3796480. | 3567933. | 3698241. | |
| MIN | 3246131. | 3057793. | 2871108. | 2713484. | 2612861. | 2651264. | 3285913. | 3765014. | 3806440. | 3683224. | 3488577. | 3246018. | 3294813. | |

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FISH RELEASE IN CFS

[illegible]

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SPILL IN CFS

[illegible]

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

POWER RELEASE IN CFS

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVEYR | CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 3813. | 3680. | 3356. | 2992. | 2793. | 2635. | 2530. | 2597. | 3079. | 3282. | 3910. | 4288. | 3246. | 1960 |
| 2 | 4014. | 3877. | 3443. | 3149. | 2941. | 2771. | 2591. | 2597. | 2851. | 3282. | 3910. | 4288. | 3310. | 1961 |
| 3 | 4014. | 3877. | 3536. | 3149. | 2941. | 2771. | 2656. | 2659. | 2851. | 3282. | 3911. | 4403. | 3338. | 1962 |
| 4 | 4014. | 3877. | 3536. | 3149. | 2941. | 2845. | 2656. | 2659. | 2851. | 3282. | 3910. | 4288. | 3334. | 1963 |
| 5 | 4014. | 3876. | 3536. | 3149. | 2941. | 2771. | 2656. | 2659. | 2851. | 3282. | 3911. | 4403. | 3338. | 1964 |
| 6 | 4014. | 3877. | 3536. | 3149. | 2941. | 2845. | 2724. | 2724. | 2851. | 3282. | 3910. | 4288. | 3345. | 1965 |
| 7 | 4014. | 3877. | 3536. | 3149. | 2941. | 2771. | 2656. | 2659. | 2851. | 3282. | 3910. | 4288. | 3328. | 1966 |
| 8 | 4014. | 3877. | 3536. | 3149. | 2941. | 2771. | 2591. | 2597. | 2851. | 3282. | 3910. | 4288. | 3317. | 1967 |
| 9 | 4014. | 3876. | 3444. | 3149. | 2865. | 2771. | 2591. | 2597. | 2851. | 3282. | 3911. | 4403. | 3313. | 1968 |
| 10 | 4014. | 3877. | 3536. | 3149. | 2941. | 2771. | 2591. | 2659. | 2851. | 3282. | 3910. | 4288. | 3323. | 1969 |
| 11 | 4014. | 3877. | 3536. | 3149. | 2865. | 2771. | 2656. | 2659. | 2920. | 3363. | 4013. | 4405. | 3352. | 1970 |
| MEAN | 3996. | 3859. | 3503. | 3135. | 2914. | 2772. | 2627. | 2643. | 2878. | 3289. | 3920. | 4330. | 3322. | |
| MAX | 4014. | 3877. | 3536. | 3149. | 2941. | 2845. | 2724. | 2724. | 3079. | 3363. | 4013. | 4405. | 3352. | |
| MIN | 3813. | 3680. | 3356. | 2992. | 2793. | 2635. | 2530. | 2597. | 2851. | 3282. | 3910. | 4288. | 3246. | |

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

INFLOWS TO THE LAKE IN CFS

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVEYR | CALYR |
|------|------|------|------|------|-------|-------|--------|--------|--------|-------|-------|------|-------|-------|
| 1 | 400. | 307. | 267. | 393. | 3637. | 6837. | 11209. | 9337. | 3145. | 1439. | 799. | 870. | 3220. | 1960 |
| 2 | 877. | 589. | 470. | 346. | 1081. | 7983. | 12808. | 10899. | 6225. | 1586. | 843. | 696. | 3767. | 1961 |
| 3 | 633. | 541. | 471. | 470. | 1265. | 7925. | 13149. | 10411. | 5542. | 1197. | 863. | 613. | 3590. | 1962 |
| 4 | 458. | 357. | 315. | 337. | 1801. | 4735. | 13249. | 12208. | 5847. | 2056. | 930. | 710. | 3587. | 1963 |
| 5 | 364. | 435. | 332. | 477. | 1830. | 8093. | 10700. | 11798. | 4246. | 1245. | 909. | 662. | 3424. | 1964 |
| 6 | 419. | 215. | 337. | 398. | 1286. | 3490. | 13046. | 10516. | 10802. | 2114. | 597. | 466. | 3641. | 1965 |
| 7 | 388. | 336. | 350. | 410. | 1893. | 8072. | 10303. | 9974. | 6608. | 1953. | 910. | 313. | 3459. | 1966 |
| 8 | 531. | 449. | 384. | 880. | 2030. | 8761. | 14931. | 15695. | 6191. | 2040. | 1215. | 571. | 4473. | 1967 |
| 9 | 534. | 510. | 467. | 630. | 2996. | 7808. | 13117. | 11257. | 2793. | 976. | 689. | 612. | 3532. | 1968 |
| 10 | 485. | 486. | 500. | 652. | 1948. | 9271. | 12510. | 7297. | 2793. | 3057. | 1215. | 541. | 3396. | 1969 |
| 11 | 497. | 504. | 550. | 899. | 2265. | 6789. | 10360. | 7986. | 2734. | 1359. | 742. | 460. | 2929. | 1970 |
| MEAN | 511. | 430. | 404. | 536. | 2076. | 7251. | 12307. | 10671. | 5175. | 1729. | 883. | 592. | 3547. | |
| MAX | 877. | 589. | 550. | 899. | 3637. | 9271. | 14931. | 15695. | 10802. | 3057. | 1215. | 870. | 4473. | |
| MIN | 364. | 215. | 267. | 337. | 1265. | 3490. | 10303. | 7297. | 2734. | 976. | 597. | 313. | 2929. | |

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

RESERVOIR STORAGE-ELEVATION-AREA:

| AC-FT | FEET | ACRE |
|----------|-------|--------|
| 0. | 760. | 0. |
| 2025. | 765. | 810. |
| 7300. | 770. | 1300. |
| 27200. | 780. | 2690. |
| 111000. | 800. | 5670. |
| 241000. | 820. | 7320. |
| 397000. | 840. | 8270. |
| 572000. | 860. | 9280. |
| 769000. | 880. | 10400. |
| 988000. | 900. | 11590. |
| 1224000. | 920. | 11960. |
| 1467000. | 940. | 12320. |
| 1717000. | 960. | 12650. |
| 1973000. | 980. | 12980. |
| 2236000. | 1000. | 13280. |
| 2504000. | 1020. | 13520. |
| 2776000. | 1040. | 13740. |
| 3053000. | 1060. | 13960. |
| 3335000. | 1080. | 14170. |
| 3620000. | 1100. | 14390. |
| 3910000. | 1120. | 14620. |
| 4033200. | 1128. | 15212. |

TAILWATER-FLOW RELATIONSHIP:

| FEET | CFS |
|------|---------|
| 210. | 0. |
| 210. | 100000. |

MONTHLY MINIMUM INSTREAM FLOWS IN CFS:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

MONTHLY DIVERSION REQUIREMENTS IN CFS:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

MONTHLY RESERVOIR EVAPORATION IN INCHES:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

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ALTERNATIVE A: MCARTHUR SHORT TUNNEL, W/O FISH RELEASES

INSTALLED CAPACITY: 400000. KW

ANNUAL PLANT FACTOR: .5

OVERLOAD FACTOR: 1.00

PLANT EFFICIENCY: .850

FRICTION LOSS COEFFICIENT: .000002370

MONTHLY LOAD FACTORS:

.920 .870 .780 .700 .640 .620 .610 .640 .700 .800 .920 1.000

INITIAL LAKE STORAGE : 4033200. AC-FT

MINIMUM LAKE STORAGE : 0. AC-FT

MAXIMUM LAKE STORAGE : 4033200. AC-FT

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SPILL IN CFS

[illegible]

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FISH RELEASE IN CFS

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NET EVAPORATION IN AC-FT

[illegible]

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ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

E.O.P. STORAGE IN ACRE-FT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR CALYR |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| 1 | 3831933. | 3644415. | 3459987. | 3310606. | 3372125. | 3627219. | 4033200. | 4033200. | 4033200. | 3928218. | 3749757. | 3545788. | 3714137. 1960 |
| 2 | 3357525. | 3177621. | 2998464. | 2833961. | 2776163. | 3088971. | 3722366. | 4033200. | 4033200. | 3937256. | 3761414. | 3546746. | 3438907. 1961 |
| 3 | 3343480. | 3160911. | 2981815. | 2824690. | 2722736. | 3032053. | 3686391. | 4033200. | 4033200. | 3913338. | 3738685. | 3519172. | 3415806. 1962 |
| 4 | 3307604. | 3114656. | 2918324. | 2753285. | 2684231. | 2797895. | 3453292. | 4033200. | 4033200. | 3966156. | 3795490. | 3581683. | 3369918. 1963 |
| 5 | 3361876. | 3166690. | 2979048. | 2822339. | 2761406. | 3080719. | 3579412. | 4033200. | 4033200. | 3916289. | 3744374. | 3527616. | 3417181. 1964 |
| 6 | 3311191. | 3110578. | 2915599. | 2754189. | 2653470. | 2693051. | 3330460. | 3814864. | 4033200. | 3969722. | 3779241. | 3550432. | 3326333. 1965 |
| 7 | 3332100. | 3137986. | 2943806. | 2783110. | 2719771. | 3037835. | 3512089. | 3968230. | 4033200. | 3959822. | 3787967. | 3549749. | 3397139. 1966 |
| 8 | 3340211. | 3152532. | 2968270. | 2835542. | 2786906. | 3146007. | 3909940. | 4033200. | 4033200. | 3965172. | 3811465. | 3589111. | 3464296. 1967 |
| 9 | 3379757. | 3188885. | 3009543. | 2861939. | 2872700. | 3175094. | 3827489. | 4033200. | 4033200. | 3899749. | 3714608. | 3485208. | 3456781. 1968 |
| 10 | 3272841. | 3087057. | 2902100. | 2755805. | 2695790. | 3085199. | 3700270. | 3991830. | 3995875. | 3990379. | 3844274. | 3620075. | 3411791. 1969 |
| 11 | 3408630. | 3224007. | 3049768. | 2918171. | 2883985. | 3125744. | 3608617. | 3942521. | 3943055. | 3826882. | 3644895. | 3406148. | 3415202. 1970 |
| MEAN | 3386104. | 3196849. | 3011520. | 2859421. | 2811753. | 3080890. | 3669411. | 3995440. | 4021612. | 3933907. | 3761106. | 3538339. | 3438863. |
| MAX | 3831933. | 3644415. | 3459987. | 3310606. | 3372125. | 3627219. | 4033200. | 4033200. | 4033200. | 3990379. | 3844274. | 3620075. | 3714137. |
| MIN | 3272841. | 3087057. | 2902100. | 2753285. | 2653470. | 2693051. | 3330460. | 3814864. | 3943055. | 3826882. | 3644895. | 3406148. | 3326333. |

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ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

E.O.P. LAKE LEVEL IN FEET

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR | CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 1100. | 1100. | 1080. | 1060. | 1080. | 1100. | 1120. | 1120. | 1120. | 1120. | 1100. | 1080. | 1098. | 1960 |
| 2 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1080. | 1961 |
| 3 | 1080. | 1060. | 1040. | 1040. | 1020. | 1040. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1077. | 1962 |
| 4 | 1060. | 1060. | 1040. | 1020. | 1020. | 1040. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1072. | 1963 |
| 5 | 1080. | 1060. | 1040. | 1040. | 1020. | 1060. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1077. | 1964 |
| 6 | 1060. | 1060. | 1040. | 1020. | 1020. | 1020. | 1060. | 1100. | 1120. | 1120. | 1100. | 1080. | 1067. | 1965 |
| 7 | 1060. | 1060. | 1040. | 1040. | 1020. | 1040. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1073. | 1966 |
| 8 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1080. | 1967 |
| 9 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1100. | 1120. | 1120. | 1100. | 1100. | 1080. | 1078. | 1968 |
| 10 | 1060. | 1060. | 1040. | 1020. | 1020. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1100. | 1077. | 1969 |
| 11 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1080. | 1120. | 1120. | 1100. | 1100. | 1080. | 1077. | 1970 |
| MEAN | 1075. | 1064. | 1044. | 1036. | 1033. | 1055. | 1091. | 1118. | 1120. | 1116. | 1100. | 1082. | 1078. | |
| MAX | 1100. | 1100. | 1080. | 1060. | 1080. | 1100. | 1120. | 1120. | 1120. | 1120. | 1100. | 1100. | 1098. | |
| MIN | 1060. | 1060. | 1040. | 1020. | 1020. | 1020. | 1060. | 1100. | 1120. | 1100. | 1100. | 1080. | 1067. | |

WATER BALANCE

[illegible]

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ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

POWER IN MW

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR | CALYR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| 1 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1960 |
| 2 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1961 |
| 3 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1962 |
| 4 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1963 |
| 5 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1964 |
| 6 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1965 |
| 7 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1966 |
| 8 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1967 |
| 9 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1968 |
| 10 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1969 |
| 11 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1970 |
| MEAN | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |
| MAX | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |
| MIN | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |

ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

ENERGY IN MWH

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTYR | CALYR |
|------|---------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|---------|----------|-------|
| 1 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1960 |
| 2 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1961 |
| 3 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1962 |
| 4 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1963 |
| 5 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1964 |
| 6 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1965 |
| 7 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1966 |
| 8 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1967 |
| 9 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1968 |
| 10 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1969 |
| 11 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1970 |
| MEAN | 133920. | 115500. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1314253. | |
| MAX | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | |
| MIN | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | |

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ENERGY DEFICIT IN MNH

[illegible]

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AVERAGE GENERATION IN MW IN MONTHS OF SPILLS

[illegible]

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SURPLUS ENERGY IN MWH

[illegible]

ALTERNATIVE C: CHAKACHATNA TUNNEL, WITHOUT FISH RELEASES

REMAINING SPILLS IN CFS

[illegible]

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ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

INSTALLED CAPACITY: 300000. KW

ANNUAL PLANT FACTOR: .5

OVERLOAD FACTOR: 1.00

PLANT EFFICIENCY: .850

FRICTION LOSS COEFFICIENT: .000002800

MONTHLY LOAD FACTORS:

.920 .870 .780 .700 .640 .620 .610 .640 .700 .800 .920 1.000

INITIAL LAKE STORAGE :4033200. AC-FT

MINIMUM LAKE STORAGE :2423600. AC-FT

MAXIMUM LAKE STORAGE :4033200. AC-FT

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ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

RESERVOIR STORAGE-ELEVATION-AREA:

| AC-FT | FEET | ACRE |
|----------|-------|--------|
| 0. | 760. | 0. |
| 2025. | 765. | 810. |
| 7300. | 770. | 1300. |
| 27200. | 780. | 2690. |
| 111000. | 800. | 5670. |
| 241000. | 820. | 7320. |
| 397000. | 840. | 8270. |
| 572000. | 860. | 9280. |
| 769000. | 880. | 10400. |
| 988000. | 900. | 11590. |
| 1224000. | 920. | 11960. |
| 1467000. | 940. | 12320. |
| 1717000. | 960. | 12650. |
| 1973000. | 980. | 12980. |
| 2236000. | 1000. | 13280. |
| 2504000. | 1020. | 13520. |
| 2776000. | 1040. | 13740. |
| 3053000. | 1060. | 13960. |
| 3335000. | 1080. | 14170. |
| 3620000. | 1100. | 14390. |
| 3910000. | 1120. | 14620. |
| 4033200. | 1128. | 15212. |

TAILWATER-FLOW RELATIONSHIP:

| FEET | CFS |
|------|---------|
| 400. | 0. |
| 400. | 100000. |

MONTHLY MINIMUM INSTREAM FLOWS IN CFS:

30. 30. 30. 30. 30. 30. 30. 30. 30. 30. 30. 30.

MONTHLY DIVERSION REQUIREMENTS IN CFS:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

MONTHLY RESERVOIR EVAPORATION IN INCHES:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

INFLOWS TO THE LAKE IN CFS

ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVE YR | CAL YR |
|------|------|------|------|------|-------|-------|--------|--------|--------|-------|-------|------|--------|--------|
| 1 | 400. | 307. | 267. | 393. | 3637. | 6837. | 11209. | 9337. | 3145. | 1439. | 799. | 870. | 3220. | 1960 |
| 2 | 877. | 589. | 470. | 346. | 1881. | 7983. | 12808. | 10899. | 6225. | 1586. | 843. | 696. | 3767. | 1961 |
| 3 | 633. | 541. | 471. | 470. | 1265. | 7925. | 13149. | 10411. | 5542. | 1197. | 863. | 613. | 3590. | 1962 |
| 4 | 498. | 357. | 315. | 337. | 1801. | 4735. | 13249. | 12208. | 5847. | 2056. | 930. | 710. | 3587. | 1963 |
| 5 | 364. | 435. | 332. | 477. | 1830. | 8093. | 10700. | 11798. | 4246. | 1245. | 909. | 662. | 3424. | 1964 |
| 6 | 419. | 219. | 337. | 398. | 1286. | 3490. | 13046. | 10516. | 10802. | 2114. | 597. | 466. | 3641. | 1965 |
| 7 | 388. | 336. | 350. | 410. | 1893. | 8072. | 10303. | 9974. | 6608. | 1953. | 910. | 313. | 3459. | 1966 |
| 8 | 531. | 449. | 384. | 880. | 2030. | 8761. | 14931. | 15695. | 6191. | 2040. | 1215. | 571. | 4473. | 1967 |
| 9 | 534. | 510. | 467. | 630. | 2996. | 7808. | 13117. | 11257. | 2793. | 976. | 689. | 612. | 3532. | 1968 |
| 10 | 485. | 486. | 500. | 652. | 1948. | 9271. | 12510. | 7297. | 2793. | 3057. | 1215. | 541. | 3396. | 1969 |
| 11 | 497. | 504. | 550. | 899. | 2265. | 6769. | 10360. | 7986. | 2734. | 1359. | 742. | 460. | 2929. | 1970 |
| MEAN | 511. | 430. | 404. | 536. | 2076. | 7251. | 12307. | 10671. | 5175. | 1729. | 883. | 592. | 3547. | |
| MAX | 877. | 589. | 550. | 899. | 3637. | 9271. | 14931. | 15695. | 10802. | 3057. | 1215. | 870. | 4473. | |
| MIN | 364. | 219. | 267. | 337. | 1265. | 3490. | 10303. | 7297. | 2734. | 976. | 597. | 313. | 2929. | |

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ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

POWER RELEASE IN CFS

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|
| 1 | 3673. | 3567. | 3266. | 2903. | 2726. | 2550. | 2429. | 2478. | 3076. | 3146. | 3798. | 4187. | 3150. 1960 |
| 2 | 3939. | 3828. | 3384. | 3111. | 2821. | 2727. | 2507. | 2479. | 2725. | 3146. | 3798. | 4187. | 3221. 1961 |
| 3 | 3939. | 3828. | 3381. | 3111. | 2923. | 2727. | 2506. | 2555. | 2725. | 3146. | 3798. | 4343. | 3248. 1962 |
| 4 | 3939. | 3831. | 3508. | 3111. | 2924. | 2825. | 2591. | 2556. | 2725. | 3146. | 3798. | 4187. | 3262. 1963 |
| 5 | 3939. | 3828. | 3381. | 3111. | 2923. | 2727. | 2590. | 2556. | 2725. | 3146. | 3798. | 4187. | 3243. 1964 |
| 6 | 3939. | 3831. | 3508. | 3111. | 2924. | 2825. | 2680. | 2638. | 2725. | 3146. | 3798. | 4187. | 3276. 1965 |
| 7 | 3939. | 3831. | 3508. | 3111. | 2924. | 2727. | 2590. | 2556. | 2725. | 3146. | 3798. | 4187. | 3253. 1966 |
| 8 | 3939. | 3831. | 3508. | 3111. | 2821. | 2727. | 2507. | 2479. | 2725. | 3146. | 3798. | 4187. | 3232. 1967 |
| 9 | 3939. | 3828. | 3384. | 3111. | 2821. | 2726. | 2507. | 2479. | 2725. | 3146. | 3800. | 4343. | 3234. 1968 |
| 10 | 3939. | 3831. | 3508. | 3111. | 2924. | 2727. | 2507. | 2555. | 2725. | 3146. | 3798. | 4187. | 3247. 1969 |
| 11 | 3939. | 3828. | 3384. | 3111. | 2821. | 2726. | 2590. | 2556. | 2811. | 3249. | 3800. | 4348. | 3264. 1970 |
| MEAN | 3915. | 3806. | 3429. | 3092. | 2868. | 2728. | 2546. | 2535. | 2765. | 3156. | 3799. | 4230. | 3239. |
| MAX | 3939. | 3831. | 3508. | 3111. | 2924. | 2825. | 2680. | 2638. | 3076. | 3249. | 3800. | 4348. | 3276. |
| MIN | 3673. | 3567. | 3266. | 2903. | 2726. | 2550. | 2429. | 2478. | 2725. | 3146. | 3798. | 4187. | 3150. |

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SPILL IN CFS

[illegible]

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FISH RELEASE IN CFS

[illegible]

ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

,NET EVAPORATION IN AC-FT

[illegible]

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ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

E.O.P. STORAGE IN ACRE-FT

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR | CALYR |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------|
| 1 | 3830088. | 3640844. | 3454572. | 3303406. | 3357590. | 3610899. | 4033200. | 4033200. | 4033200. | 3926373. | 3746127. | 3540314. | 3709151. | 1960 |
| 2 | 3350206. | 3168636. | 2987635. | 2821346. | 2761704. | 3072687. | 3704237. | 4033200. | 4033200. | 3935412. | 3757784. | 3541272. | 3430610. | 1961 |
| 3 | 3336161. | 3151926. | 2971168. | 2812258. | 2708459. | 3015991. | 3668577. | 4033200. | 4033200. | 3911493. | 3735056. | 3503872. | 3406780. | 1962 |
| 4 | 3290460. | 3095845. | 2897668. | 2730844. | 2659946. | 2771825. | 3425345. | 4017005. | 4033200. | 3964311. | 3791860. | 3576209. | 3354543. | 1963 |
| 5 | 3354557. | 3157645. | 2968341. | 2809847. | 2740789. | 3058318. | 3555166. | 4033200. | 4033200. | 3914444. | 3740744. | 3522141. | 3407366. | 1964 |
| 6 | 3303872. | 3101593. | 2904769. | 2741575. | 2639010. | 2676807. | 3312371. | 3794930. | 4033200. | 3967877. | 3775612. | 3544957. | 3316381. | 1965 |
| 7 | 3324781. | 3129000. | 2932976. | 2770495. | 2705254. | 3021533. | 3493942. | 3948239. | 4033200. | 3957978. | 3784337. | 3544275. | 3387167. | 1966 |
| 8 | 3332892. | 3143387. | 2949452. | 2814939. | 2764459. | 3121736. | 3883824. | 4033200. | 4033200. | 3963327. | 3807835. | 3583637. | 3452657. | 1967 |
| 9 | 3372438. | 3179840. | 2998654. | 2849265. | 2858181. | 3158790. | 3809340. | 4033200. | 4033200. | 3897904. | 3710979. | 3479733. | 3448460. | 1968 |
| 10 | 3265522. | 3078072. | 2891270. | 2743190. | 2681330. | 3068954. | 3682181. | 3971897. | 3974156. | 3966816. | 3811324. | 3585281. | 3393333. | 1969 |
| 11 | 3371807. | 3185517. | 3009435. | 2876052. | 2840021. | 3079996. | 3555938. | 3887997. | 3881626. | 3763544. | 3579772. | 3338880. | 3364215. | 1970 |
| MEAN | 3375707. | 3184755. | 2996903. | 2843020. | 2792431. | 3059776. | 3647647. | 3983570. | 4014053. | 3924498. | 3749221. | 3523688. | 3424606. | |
| MAX | 3830088. | 3640844. | 3454572. | 3303406. | 3357590. | 3610899. | 4033200. | 4033200. | 4033200. | 3967877. | 3811324. | 3585281. | 3709151. | |
| MIN | 3265522. | 3078072. | 2891270. | 2730844. | 2639010. | 2676807. | 3312371. | 3794930. | 3881626. | 3763544. | 3579772. | 3338880. | 3316381. | |

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ALTERNATIVE D: CHAKACHATHA TUNNEL, WITH FISH RELEASES

E.O.P. LAKE LEVEL IN FEET

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR | CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 1100. | 1100. | 1080. | 1060. | 1080. | 1080. | 1120. | 1120. | 1120. | 1120. | 1100. | 1080. | 1097. | 1960 |
| 2 | 1080. | 1060. | 1040. | 1040. | 1020. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1078. | 1961 |
| 3 | 1080. | 1060. | 1040. | 1040. | 1020. | 1040. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1077. | 1962 |
| 4 | 1060. | 1060. | 1040. | 1020. | 1020. | 1020. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1070. | 1963 |
| 5 | 1080. | 1060. | 1040. | 1040. | 1020. | 1060. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1077. | 1964 |
| 6 | 1060. | 1060. | 1040. | 1020. | 1020. | 1020. | 1060. | 1100. | 1120. | 1120. | 1100. | 1080. | 1067. | 1965 |
| 7 | 1060. | 1060. | 1040. | 1020. | 1020. | 1040. | 1080. | 1120. | 1120. | 1120. | 1100. | 1080. | 1072. | 1966 |
| 8 | 1060. | 1060. | 1040. | 1040. | 1020. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1077. | 1967 |
| 9 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1100. | 1120. | 1120. | 1100. | 1100. | 1080. | 1078. | 1968 |
| 10 | 1060. | 1060. | 1040. | 1020. | 1020. | 1060. | 1100. | 1120. | 1120. | 1120. | 1100. | 1080. | 1075. | 1969 |
| 11 | 1080. | 1060. | 1040. | 1040. | 1040. | 1060. | 1080. | 1100. | 1100. | 1100. | 1080. | 1080. | 1072. | 1970 |
| MEAN | 1073. | 1064. | 1044. | 1035. | 1029. | 1051. | 1091. | 1116. | 1118. | 1116. | 1098. | 1080. | 1076. | |
| MAX | 1100. | 1100. | 1080. | 1060. | 1080. | 1080. | 1120. | 1120. | 1120. | 1120. | 1100. | 1080. | 1097. | |
| MIN | 1060. | 1060. | 1040. | 1020. | 1020. | 1020. | 1060. | 1100. | 1100. | 1100. | 1080. | 1080. | 1067. | |

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ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

[illegible]

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ALTERNATIVE D: CHAKACHATHA TUNNEL, WITH FISH RELEASES

POWER IN MW

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | AVEYR | CALYR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| 1 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1960 |
| 2 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1961 |
| 3 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1962 |
| 4 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1963 |
| 5 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1964 |
| 6 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1965 |
| 7 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1966 |
| 8 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1967 |
| 9 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1968 |
| 10 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1969 |
| 11 | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | 1970 |
| MEAN | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |
| MAX | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |
| MIN | 180. | 170. | 153. | 137. | 125. | 121. | 119. | 125. | 137. | 157. | 180. | 196. | 150. | |

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ALTERNATIVE D1 CHAKACHATNA TUNNEL, WITH FISH RELEASES

ENERGY IN MWH

| YEAR | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | TOTYR | CALYR |
|------|---------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|---------|----------|-------|
| 1 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1960 |
| 2 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1961 |
| 3 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1962 |
| 4 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1963 |
| 5 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1964 |
| 6 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1965 |
| 7 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1966 |
| 8 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1967 |
| 9 | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | 1968 |
| 10 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1969 |
| 11 | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | 1970 |
| MEAN | 133920. | 115500. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1314253. | |
| MAX | 133920. | 118471. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1317224. | |
| MIN | 133920. | 114386. | 113541. | 98609. | 93162. | 87339. | 88795. | 93162. | 98609. | 116452. | 129600. | 145565. | 1313139. | |

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ENERGY DEFICIT IN MWH

[illegible]

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AVERAGE GENERATION IN MW IN MONTHS OF SPILLS

[illegible]

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SURPLUS ENERGY IN MWH

[illegible]

ALTERNATIVE D: CHAKACHATNA TUNNEL, WITH FISH RELEASES

REMAINING SPILLS IN CFS

[illegible]

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

INSTALLED CAPACITY: 330000. KW

ANNUAL PLANT FACTOR: .45

OVERLOAD FACTOR: 1.00

PLANT EFFICIENCY: .850

FRICTION LOSS COEFFICIENT: .000002370

STARTER CAPACITY: 5000. CFS

TOLERANCE: .010 PERCENT

MONTHLY LOAD FACTORS:

.640 .620 .610 .640 .700 .800 .920 1.000 .920 .870 .780 .700

INITIAL LAKE STORAGE :4477500. AC-FT

MINIMUM LAKE STORAGE :3377750. AC-FT

MAXIMUM LAKE STORAGE :4477500. AC-FT

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

RESERVOIR STORAGE-ELEVATION-AREA:

| AC-FT | FEET | ACRE |
|----------|-------|--------|
| 0. | 760. | 0. |
| 2025. | 765. | 810. |
| 7300. | 770. | 1300. |
| 27200. | 780. | 2690. |
| 111000. | 800. | 5670. |
| 241000. | 820. | 7320. |
| 397000. | 840. | 8270. |
| 572000. | 860. | 9280. |
| 769000. | 880. | 10400. |
| 988000. | 900. | 11590. |
| 1224000. | 920. | 11960. |
| 1467000. | 940. | 12320. |
| 1717000. | 960. | 12650. |
| 1973000. | 980. | 12980. |
| 2236000. | 1000. | 13280. |
| 2504000. | 1020. | 13520. |
| 2776000. | 1040. | 13740. |
| 3053000. | 1060. | 13960. |
| 3335000. | 1080. | 14170. |
| 3620000. | 1100. | 14390. |
| 3910000. | 1120. | 14620. |
| 4218000. | 1140. | 16100. |
| 4250000. | 1142. | 16780. |
| 4477500. | 1155. | 17842. |

TAILWATER-FLOW RELATIONSHIP:

| FEET | CFS |
|------|---------|
| 210. | 0. |
| 210. | 100000. |

MONTHLY MINIMUM INSTREAM FLOWS IN CFS:

1094. 1094. 1094. 1094. 1094. 365. 365. 365. 365. 365. 365. 1094.

MONTHLY DIVERSION REQUIREMENTS IN CFS:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

MONTHLY RESERVOIR EVAPORATION IN INCHES:

0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

INFLOWS TO THE LAKE IN CFS

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR | CALYR |
|------|-------|--------|--------|--------|--------|-------|-------|-------|-------|------|------|-------|-------|-------|
| 1 | 4513. | 10728. | 15220. | 11615. | 6305. | 2689. | 802. | 636. | 542. | 488. | 493. | 541. | 4548. | 1950 |
| 2 | 2055. | 8572. | 13194. | 10548. | 4521. | 1761. | 569. | 532. | 495. | 472. | 450. | 631. | 3650. | 1951 |
| 3 | 3801. | 10719. | 13095. | 8831. | 8635. | 3216. | 842. | 699. | 630. | 495. | 467. | 510. | 4328. | 1952 |
| 4 | 2027. | 8204. | 12575. | 9431. | 3562. | 2712. | 865. | 642. | 523. | 477. | 477. | 641. | 3511. | 1953 |
| 5 | 3992. | 13247. | 13355. | 10808. | 4505. | 2002. | 629. | 550. | 527. | 472. | 458. | 541. | 4257. | 1954 |
| 6 | 3434. | 9002. | 12091. | 12046. | 6075. | 2787. | 755. | 619. | 578. | 507. | 466. | 487. | 4071. | 1955 |
| 7 | 2193. | 6826. | 12996. | 9983. | 5068. | 1988. | 595. | 532. | 504. | 475. | 449. | 496. | 3509. | 1956 |
| 8 | 2936. | 7475. | 14601. | 10235. | 5940. | 2053. | 583. | 565. | 569. | 536. | 505. | 598. | 3883. | 1957 |
| 9 | 4393. | 14817. | 13149. | 10405. | 6910. | 2707. | 793. | 562. | 569. | 510. | 489. | 675. | 4665. | 1958 |
| 10 | 2496. | 9930. | 10163. | 8691. | 3452. | 1896. | 526. | 483. | 426. | 468. | 449. | 526. | 3292. | 1959 |
| 11 | 3120. | 9459. | 10388. | 11731. | 3662. | 1370. | 654. | 508. | 400. | 307. | 267. | 393. | 3522. | 1960 |
| 12 | 3637. | 6837. | 11209. | 9337. | 3145. | 1439. | 799. | 870. | 877. | 589. | 470. | 346. | 3296. | 1961 |
| 13 | 1881. | 7983. | 12808. | 10899. | 6225. | 1586. | 843. | 696. | 633. | 541. | 471. | 470. | 3753. | 1962 |
| 14 | 1265. | 7925. | 13149. | 10411. | 5542. | 1197. | 863. | 613. | 498. | 357. | 315. | 337. | 3539. | 1963 |
| 15 | 1801. | 4735. | 13249. | 12208. | 5847. | 2086. | 930. | 710. | 364. | 435. | 332. | 477. | 3598. | 1964 |
| 16 | 1830. | 8093. | 10700. | 11798. | 4246. | 1245. | 909. | 662. | 419. | 219. | 337. | 398. | 3405. | 1965 |
| 17 | 1286. | 3490. | 11633. | 11929. | 10802. | 2114. | 597. | 466. | 388. | 336. | 350. | 410. | 3650. | 1966 |
| 18 | 1893. | 8072. | 10303. | 9974. | 6608. | 1953. | 910. | 313. | 531. | 449. | 384. | 880. | 3523. | 1967 |
| 19 | 2030. | 8761. | 14931. | 15695. | 6191. | 2040. | 1215. | 571. | 534. | 510. | 467. | 630. | 4465. | 1968 |
| 20 | 2996. | 7808. | 13117. | 11257. | 2793. | 976. | 689. | 612. | 485. | 486. | 500. | 652. | 3531. | 1969 |
| 21 | 1948. | 9271. | 12478. | 7297. | 2793. | 3057. | 1215. | 601. | 497. | 504. | 550. | 899. | 3426. | 1970 |
| 22 | 2265. | 6789. | 10360. | 7986. | 2734. | 1359. | 742. | 460. | 394. | 441. | 513. | 1275. | 2943. | 1971 |
| 23 | 4063. | 12672. | 13695. | 16680. | 5075. | 3181. | 1090. | 736. | 581. | 531. | 492. | 479. | 4940. | 1972 |
| 24 | 3468. | 8228. | 13490. | 9263. | 5012. | 2396. | 679. | 514. | 495. | 492. | 480. | 586. | 3759. | 1973 |
| 25 | 2131. | 7457. | 8850. | 7809. | 2794. | 2527. | 740. | 623. | 558. | 526. | 501. | 554. | 2923. | 1974 |
| 26 | 4215. | 6248. | 6781. | 6159. | 6850. | 3059. | 909. | 530. | 498. | 485. | 485. | 489. | 3059. | 1975 |
| 27 | 4784. | 10649. | 10889. | 6802. | 5107. | 3136. | 814. | 622. | 544. | 524. | 498. | 625. | 3750. | 1976 |
| 28 | 5283. | 8587. | 8304. | 6494. | 4947. | 3917. | 1058. | 1055. | 1044. | 773. | 606. | 606. | 3556. | 1977 |
| 29 | 5335. | 19864. | 13898. | 11224. | 6059. | 3709. | 922. | 700. | 609. | 537. | 509. | 558. | 5327. | 1978 |
| 30 | 5387. | 7917. | 10146. | 7865. | 4513. | 3258. | 708. | 701. | 597. | 562. | 547. | 713. | 3576. | 1979 |
| 31 | 6776. | 8514. | 8958. | 9157. | 4572. | 4471. | 1412. | 882. | 762. | 718. | 647. | 810. | 3973. | 1980 |
| MEAN | 3201. | 8996. | 11928. | 10147. | 5177. | 2383. | 828. | 621. | 551. | 491. | 465. | 588. | 3781. | |
| MAX | 6776. | 19864. | 15220. | 16680. | 10802. | 4471. | 1412. | 1055. | 1044. | 773. | 647. | 1275. | 5327. | |
| MIN | 1265. | 3490. | 6781. | 6159. | 2734. | 976. | 526. | 313. | 364. | 219. | 267. | 337. | 2923. | |

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

POWER RELEASE IN CFS

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR | CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 1834. | 1756. | 1712. | 1810. | 2004. | 2311. | 2682. | 2954. | 2740. | 2614. | 2360. | 2134. | 2243. | 1950 |
| 2 | 1962. | 1879. | 1782. | 1813. | 2010. | 2315. | 2693. | 2970. | 2756. | 2631. | 2376. | 2149. | 2278. | 1951 |
| 3 | 1968. | 1867. | 1766. | 1819. | 1995. | 2309. | 2681. | 2953. | 2738. | 2612. | 2359. | 2133. | 2267. | 1952 |
| 4 | 1961. | 1880. | 1787. | 1818. | 2014. | 2311. | 2681. | 2953. | 2739. | 2613. | 2360. | 2134. | 2271. | 1953 |
| 5 | 1952. | 1842. | 1737. | 1813. | 2011. | 2314. | 2690. | 2965. | 2752. | 2626. | 2372. | 2145. | 2268. | 1954 |
| 6 | 1966. | 1874. | 1781. | 1808. | 2005. | 2311. | 2682. | 2954. | 2740. | 2614. | 2360. | 2135. | 2269. | 1955 |
| 7 | 1962. | 1886. | 1796. | 1822. | 2008. | 2314. | 2690. | 2966. | 2753. | 2628. | 2374. | 2147. | 2279. | 1956 |
| 8 | 1970. | 1887. | 1788. | 1814. | 2005. | 2314. | 2689. | 2965. | 2751. | 2625. | 2370. | 2143. | 2277. | 1957 |
| 9 | 1959. | 1840. | 1731. | 1814. | 2002. | 2311. | 2682. | 2954. | 2741. | 2614. | 2361. | 2135. | 2262. | 1958 |
| 10 | 1960. | 1869. | 1781. | 1823. | 2014. | 2315. | 2691. | 2969. | 2756. | 2631. | 2377. | 2150. | 2278. | 1959 |
| 11 | 1971. | 1879. | 1790. | 1820. | 2014. | 2317. | 2696. | 2974. | 2761. | 2638. | 2384. | 2157. | 2284. | 1960 |
| 12 | 1976. | 1892. | 1809. | 1842. | 2016. | 2317. | 2695. | 2969. | 2751. | 2622. | 2368. | 2141. | 2283. | 1961 |
| 13 | 1970. | 1889. | 1795. | 1819. | 2004. | 2316. | 2693. | 2967. | 2752. | 2625. | 2371. | 2144. | 2279. | 1962 |
| 14 | 1975. | 1898. | 1802. | 1826. | 2007. | 2318. | 2697. | 2973. | 2759. | 2634. | 2381. | 2154. | 2285. | 1963 |
| 15 | 1982. | 1917. | 1830. | 1843. | 2006. | 2314. | 2687. | 2959. | 2746. | 2622. | 2369. | 2143. | 2285. | 1964 |
| 16 | 1972. | 1891. | 1805. | 1832. | 2012. | 2318. | 2696. | 2972. | 2758. | 2633. | 2380. | 2153. | 2285. | 1965 |
| 17 | 1984. | 1927. | 1852. | 1868. | 1987. | 2314. | 2689. | 2965. | 2753. | 2629. | 2376. | 2149. | 2291. | 1966 |
| 18 | 1977. | 1896. | 1811. | 1845. | 2003. | 2315. | 2689. | 2964. | 2751. | 2626. | 2372. | 2146. | 2283. | 1967 |
| 19 | 1973. | 1889. | 1783. | 1796. | 2004. | 2314. | 2686. | 2957. | 2744. | 2618. | 2365. | 2139. | 2272. | 1968 |
| 20 | 1962. | 1878. | 1785. | 1811. | 2017. | 2322. | 2704. | 2983. | 2768. | 2643. | 2387. | 2159. | 2285. | 1969 |
| 21 | 1986. | 1899. | 1800. | 1837. | 2017. | 2312. | 2679. | 2949. | 2735. | 2610. | 2356. | 2130. | 2276. | 1970 |
| 22 | 1957. | 1881. | 1803. | 1844. | 2017. | 2321. | 2700. | 2979. | 2766. | 2642. | 2386. | 2157. | 2288. | 1971 |
| 23 | 1973. | 1862. | 1754. | 1793. | 2008. | 2309. | 2680. | 2950. | 2735. | 2609. | 2356. | 2130. | 2263. | 1972 |
| 24 | 1951. | 1864. | 1771. | 1818. | 2009. | 2313. | 2685. | 2960. | 2747. | 2621. | 2367. | 2141. | 2270. | 1973 |
| 25 | 1968. | 1889. | 1813. | 1860. | 2020. | 2318. | 2691. | 2966. | 2752. | 2625. | 2371. | 2144. | 2285. | 1974 |
| 26 | 1961. | 1878. | 1816. | 1878. | 2029. | 2310. | 2681. | 2953. | 2740. | 2614. | 2361. | 2135. | 2280. | 1975 |
| 27 | 1949. | 1846. | 1758. | 1826. | 2008. | 2309. | 2682. | 2954. | 2740. | 2614. | 2361. | 2135. | 2265. | 1976 |
| 28 | 1947. | 1850. | 1776. | 1833. | 2009. | 2306. | 2680. | 2948. | 2728. | 2598. | 2343. | 2117. | 2261. | 1977 |
| 29 | 1931. | 1794. | 1716. | 1811. | 2005. | 2307. | 2681. | 2952. | 2737. | 2611. | 2357. | 2131. | 2253. | 1978 |
| 30 | 1943. | 1849. | 1771. | 1823. | 2011. | 2309. | 2682. | 2954. | 2740. | 2613. | 2359. | 2133. | 2265. | 1979 |
| 31 | 1938. | 1836. | 1763. | 1818. | 2010. | 2303. | 2678. | 2945. | 2728. | 2600. | 2345. | 2119. | 2257. | 1980 |
| MEAN | 1959. | 1870. | 1783. | 1826. | 2009. | 2313. | 2688. | 2961. | 2747. | 2621. | 2367. | 2141. | 2274. | |
| MAX | 1986. | 1927. | 1852. | 1878. | 2029. | 2322. | 2704. | 2983. | 2768. | 2643. | 2387. | 2159. | 2291. | |
| MIN | 1834. | 1756. | 1712. | 1793. | 1987. | 2303. | 2678. | 2945. | 2728. | 2598. | 2343. | 2117. | 2243. | |

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SPILL IN CFS

[illegible]

ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

FISH RELEASE IN CFS

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR | CALYR |
|------|-------|-------|-------|-------|-------|------|------|------|------|------|------|-------|-------|-------|
| 1 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 541. | 683. | 1950 |
| 2 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 631. | 691. | 1951 |
| 3 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 510. | 681. | 1952 |
| 4 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 641. | 692. | 1953 |
| 5 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 541. | 683. | 1954 |
| 6 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 487. | 679. | 1955 |
| 7 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 496. | 680. | 1956 |
| 8 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 598. | 688. | 1957 |
| 9 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 675. | 695. | 1958 |
| 10 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 526. | 682. | 1959 |
| 11 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 307. | 267. | 393. | 658. | 1960 |
| 12 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 346. | 667. | 1961 |
| 13 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 470. | 678. | 1962 |
| 14 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 357. | 315. | 337. | 662. | 1963 |
| 15 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 364. | 365. | 332. | 477. | 675. | 1964 |
| 16 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 219. | 337. | 398. | 657. | 1965 |
| 17 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 336. | 350. | 410. | 669. | 1966 |
| 18 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 313. | 365. | 365. | 365. | 880. | 707. | 1967 |
| 19 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 630. | 691. | 1968 |
| 20 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 652. | 693. | 1969 |
| 21 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 899. | 713. | 1970 |
| 22 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 1094. | 730. | 1971 |
| 23 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 479. | 678. | 1972 |
| 24 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 586. | 687. | 1973 |
| 25 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 554. | 685. | 1974 |
| 26 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 489. | 679. | 1975 |
| 27 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 625. | 690. | 1976 |
| 28 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 606. | 689. | 1977 |
| 29 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 558. | 685. | 1978 |
| 30 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 713. | 698. | 1979 |
| 31 | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 810. | 706. | 1980 |
| MEAN | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 363. | 365. | 357. | 358. | 582. | 685. | |
| MAX | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 365. | 365. | 365. | 365. | 1094. | 730. | |
| MIN | 1094. | 1094. | 1094. | 1094. | 1094. | 365. | 365. | 313. | 364. | 219. | 267. | 337. | 657. | |

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NET EVAPORATION IN AC-FT

[illegible]

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

E.O.P. STORAGE IN ACRE-FT

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR | CALYR |
|------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-------|
| 1 | 4477500. | 4477500. | 4477500. | 4477500. | 4477500. | 4477500. | 4343937. | 4178982. | 4021409. | 3883070. | 3745820. | 3618830. | 4221420. | 1950 |
| 2 | 3557280. | 3890445. | 4477500. | 4477500. | 4477500. | 4420969. | 4272884. | 4100551. | 3939069. | 3798899. | 3658001. | 3530102. | 4050058. | 1951 |
| 3 | 3575561. | 4037206. | 4477500. | 4477500. | 4477500. | 4477500. | 4346329. | 4185300. | 4033252. | 3890484. | 3751712. | 3624782. | 4112885. | 1952 |
| 4 | 3561561. | 3872769. | 4468818. | 4477500. | 4477500. | 4477500. | 4347705. | 4183166. | 4024470. | 3885551. | 3747340. | 3620366. | 4095354. | 1953 |
| 5 | 3678513. | 4292086. | 4477500. | 4477500. | 4477500. | 4435854. | 4291513. | 4120550. | 3961305. | 3821397. | 3681259. | 3553606. | 4105715. | 1954 |
| 6 | 3576621. | 3935657. | 4477500. | 4477500. | 4477500. | 4477500. | 4341126. | 4175085. | 4019690. | 3882394. | 3743466. | 3616452. | 4100041. | 1955 |
| 7 | 3563406. | 3792268. | 4413665. | 4477500. | 4477500. | 4434989. | 4288605. | 4116489. | 3955768. | 3810939. | 3670121. | 3542351. | 4045300. | 1956 |
| 8 | 3534480. | 3801875. | 4477500. | 4477500. | 4477500. | 4439004. | 4291944. | 4121916. | 3965287. | 3829002. | 3691860. | 3564316. | 4056015. | 1957 |
| 9 | 3646696. | 4353809. | 4477500. | 4477500. | 4477500. | 4477500. | 4343398. | 4173860. | 4017892. | 3880744. | 3743219. | 3616202. | 4140485. | 1958 |
| 10 | 3581877. | 3996422. | 4444553. | 4477500. | 4477500. | 4429307. | 4278737. | 4103451. | 3937736. | 3797327. | 3656348. | 3528432. | 4059099. | 1959 |
| 11 | 3531794. | 3917746. | 4379145. | 4477500. | 4477500. | 4396818. | 4253567. | 4079480. | 3911849. | 3760115. | 3613499. | 3485129. | 4023679. | 1960 |
| 12 | 3520005. | 3749135. | 4259863. | 4477500. | 4477500. | 4401080. | 4266546. | 4115051. | 3977393. | 3844210. | 3705083. | 3577675. | 4030920. | 1961 |
| 13 | 3504965. | 3802458. | 4412330. | 4477500. | 4477500. | 4410160. | 4278352. | 4116247. | 3963506. | 3827479. | 3688216. | 3560635. | 4043279. | 1962 |
| 14 | 3449689. | 3743212. | 4373660. | 4477500. | 4477500. | 4386133. | 4255271. | 4087709. | 3926248. | 3779949. | 3633568. | 3505411. | 4007987. | 1963 |
| 15 | 3427032. | 3529642. | 4164483. | 4477500. | 4477500. | 4441042. | 4314758. | 4154012. | 3985169. | 3838383. | 3692693. | 3565157. | 4005614. | 1964 |
| 16 | 3489171. | 3793096. | 4272757. | 4477500. | 4477500. | 4389098. | 4261018. | 4096569. | 3930333. | 3784082. | 3637751. | 3509638. | 4009876. | 1965 |
| 17 | 3399476. | 3427392. | 3961509. | 4477500. | 4477500. | 4442771. | 4296588. | 4120495. | 3952648. | 3806661. | 3660597. | 3532726. | 3962988. | 1966 |
| 18 | 3460307. | 3762715. | 4217620. | 4477500. | 4477500. | 4432827. | 4305262. | 4123035. | 3964069. | 3822909. | 3678212. | 3550527. | 4022707. | 1967 |
| 19 | 3486753. | 3830584. | 4477500. | 4477500. | 4477500. | 4438201. | 4328934. | 4159771. | 4001459. | 3859198. | 3720060. | 3592806. | 4070855. | 1968 |
| 20 | 3589145. | 3876930. | 4477500. | 4477500. | 4458580. | 4353391. | 4211779. | 4043551. | 3880715. | 3740634. | 3602136. | 3473645. | 4015459. | 1969 |
| 21 | 3404028. | 3777592. | 4366893. | 4477500. | 4458580. | 4477500. | 4368638. | 4201814. | 4041746. | 3904523. | 3771048. | 3644315. | 4074515. | 1970 |
| 22 | 3595992. | 3822934. | 4281846. | 4477500. | 4455056. | 4373491. | 4235260. | 4057948. | 3889667. | 3747179. | 3609563. | 3491978. | 4003201. | 1971 |
| 23 | 3553247. | 4131416. | 4477500. | 4477500. | 4477500. | 4477500. | 4361162. | 4202599. | 4047738. | 3907217. | 3770185. | 3643444. | 4127251. | 1972 |
| 24 | 3669439. | 3983032. | 4477500. | 4477500. | 4477500. | 4460189. | 4319090. | 4146270. | 3985373. | 3846862. | 3708384. | 3581010. | 4094346. | 1973 |
| 25 | 3523781. | 3790004. | 4155425. | 4453961. | 4434923. | 4425319. | 4287507. | 4121009. | 3963688. | 3826825. | 3689411. | 3561842. | 4019474. | 1974 |
| 26 | 3633198. | 3828135. | 4066131. | 4262118. | 4477500. | 4477500. | 4350336. | 4178901. | 4018605. | 3880068. | 3742288. | 3615262. | 4044170. | 1975 |
| 27 | 3722292. | 4181004. | 4477500. | 4477500. | 4477500. | 4477500. | 4344654. | 4178842. | 4021391. | 3880166. | 3743191. | 3616174. | 4133143. | 1976 |
| 28 | 3754042. | 4089818. | 4423913. | 4477500. | 4477500. | 4477500. | 4359248. | 4220394. | 4094404. | 3972776. | 3843551. | 3717551. | 4159016. | 1977 |
| 29 | 3859593. | 4477500. | 4477500. | 4477500. | 4477500. | 4477500. | 4351114. | 4190204. | 4036918. | 3901486. | 3765440. | 3638650. | 4177575. | 1978 |
| 30 | 3783157. | 4079140. | 4477500. | 4477500. | 4477500. | 4477500. | 4338314. | 4177313. | 4023122. | 3888934. | 3755092. | 3628197. | 4131939. | 1979 |
| 31 | 3858416. | 4190670. | 4477500. | 4477500. | 4477500. | 4477500. | 4380421. | 4231118. | 4087815. | 3958563. | 3831711. | 3705592. | 4179525. | 1980 |
| MEAN | 3611904. | 3943038. | 4381455. | 4469793. | 4474182. | 4442521. | 4310129. | 4143925. | 3986443. | 3847033. | 3708091. | 3581058. | 4074964. | |
| MAX | 4477500. | 4477500. | 4477500. | 4477500. | 4477500. | 4477500. | 4380421. | 4231118. | 4094404. | 3972776. | 3843551. | 3717551. | 4221420. | |
| MIN | 3399476. | 3427392. | 3961509. | 4262118. | 4434923. | 4353391. | 4211779. | 4043551. | 3880715. | 3740634. | 3602136. | 3473645. | 3962988. | |

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

E.O.P. LAKE LEVEL IN FEET

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR CALYR |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|
| 1 | 1155. | 1155. | 1155. | 1155. | 1155. | 1155. | 1147. | 1137. | 1127. | 1118. | 1109. | 1100. | 1139. 1950 |
| 2 | 1096. | 1119. | 1155. | 1155. | 1155. | 1152. | 1143. | 1132. | 1122. | 1112. | 1103. | 1094. | 1128. 1951 |
| 3 | 1097. | 1128. | 1155. | 1155. | 1155. | 1155. | 1148. | 1138. | 1128. | 1119. | 1109. | 1100. | 1132. 1952 |
| 4 | 1096. | 1117. | 1155. | 1155. | 1155. | 1155. | 1148. | 1138. | 1127. | 1118. | 1109. | 1100. | 1131. 1953 |
| 5 | 1104. | 1144. | 1155. | 1155. | 1155. | 1153. | 1144. | 1134. | 1123. | 1114. | 1104. | 1095. | 1132. 1954 |
| 6 | 1097. | 1122. | 1155. | 1155. | 1155. | 1155. | 1147. | 1137. | 1127. | 1118. | 1109. | 1100. | 1131. 1955 |
| 7 | 1096. | 1112. | 1151. | 1155. | 1155. | 1153. | 1144. | 1133. | 1123. | 1113. | 1103. | 1095. | 1128. 1956 |
| 8 | 1094. | 1113. | 1155. | 1155. | 1155. | 1153. | 1144. | 1134. | 1124. | 1114. | 1105. | 1096. | 1128. 1957 |
| 9 | 1102. | 1148. | 1155. | 1155. | 1155. | 1155. | 1147. | 1137. | 1127. | 1118. | 1108. | 1100. | 1134. 1958 |
| 10 | 1097. | 1126. | 1153. | 1155. | 1155. | 1152. | 1144. | 1133. | 1122. | 1112. | 1103. | 1094. | 1129. 1959 |
| 11 | 1094. | 1121. | 1149. | 1155. | 1155. | 1150. | 1142. | 1131. | 1120. | 1110. | 1100. | 1091. | 1126. 1960 |
| 12 | 1093. | 1109. | 1143. | 1155. | 1155. | 1151. | 1143. | 1133. | 1124. | 1115. | 1106. | 1097. | 1127. 1961 |
| 13 | 1092. | 1113. | 1151. | 1155. | 1155. | 1151. | 1144. | 1133. | 1123. | 1114. | 1105. | 1096. | 1128. 1962 |
| 14 | 1088. | 1108. | 1149. | 1155. | 1155. | 1150. | 1142. | 1132. | 1121. | 1111. | 1101. | 1092. | 1125. 1963 |
| 15 | 1086. | 1094. | 1137. | 1155. | 1155. | 1153. | 1146. | 1136. | 1125. | 1115. | 1105. | 1096. | 1125. 1964 |
| 16 | 1091. | 1112. | 1143. | 1155. | 1155. | 1150. | 1143. | 1132. | 1121. | 1111. | 1101. | 1092. | 1126. 1965 |
| 17 | 1085. | 1086. | 1123. | 1155. | 1155. | 1153. | 1145. | 1134. | 1123. | 1113. | 1103. | 1094. | 1122. 1966 |
| 18 | 1089. | 1110. | 1140. | 1155. | 1155. | 1152. | 1145. | 1134. | 1124. | 1114. | 1104. | 1095. | 1126. 1967 |
| 19 | 1091. | 1115. | 1155. | 1155. | 1155. | 1153. | 1147. | 1136. | 1126. | 1116. | 1107. | 1098. | 1129. 1968 |
| 20 | 1098. | 1118. | 1155. | 1155. | 1154. | 1148. | 1140. | 1129. | 1118. | 1108. | 1099. | 1090. | 1126. 1969 |
| 21 | 1085. | 1111. | 1149. | 1155. | 1154. | 1155. | 1149. | 1139. | 1129. | 1120. | 1110. | 1102. | 1130. 1970 |
| 22 | 1098. | 1114. | 1144. | 1155. | 1154. | 1149. | 1141. | 1130. | 1119. | 1109. | 1099. | 1091. | 1125. 1971 |
| 23 | 1095. | 1134. | 1155. | 1155. | 1155. | 1155. | 1148. | 1139. | 1129. | 1120. | 1110. | 1102. | 1133. 1972 |
| 24 | 1103. | 1125. | 1155. | 1155. | 1155. | 1154. | 1146. | 1135. | 1125. | 1116. | 1106. | 1097. | 1131. 1973 |
| 25 | 1093. | 1112. | 1136. | 1154. | 1153. | 1152. | 1144. | 1134. | 1123. | 1114. | 1105. | 1096. | 1126. 1974 |
| 26 | 1101. | 1114. | 1130. | 1143. | 1155. | 1155. | 1148. | 1137. | 1127. | 1118. | 1108. | 1100. | 1128. 1975 |
| 27 | 1107. | 1138. | 1155. | 1155. | 1155. | 1155. | 1147. | 1137. | 1127. | 1118. | 1108. | 1100. | 1134. 1976 |
| 28 | 1109. | 1132. | 1152. | 1155. | 1155. | 1155. | 1148. | 1140. | 1132. | 1124. | 1115. | 1107. | 1135. 1977 |
| 29 | 1117. | 1155. | 1155. | 1155. | 1155. | 1155. | 1148. | 1138. | 1128. | 1119. | 1110. | 1101. | 1136. 1978 |
| 30 | 1111. | 1131. | 1155. | 1155. | 1155. | 1155. | 1147. | 1137. | 1127. | 1119. | 1109. | 1101. | 1134. 1979 |
| 31 | 1116. | 1138. | 1155. | 1155. | 1155. | 1155. | 1149. | 1141. | 1132. | 1123. | 1115. | 1106. | 1137. 1980 |
| MEAN | 1099. | 1122. | 1149. | 1155. | 1155. | 1153. | 1145. | 1135. | 1125. | 1116. | 1106. | 1097. | 1130. |
| MAX | 1155. | 1155. | 1155. | 1155. | 1155. | 1155. | 1149. | 1141. | 1132. | 1124. | 1115. | 1107. | 1139. |
| MIN | 1085. | 1086. | 1123. | 1143. | 1153. | 1148. | 1140. | 1129. | 1118. | 1108. | 1099. | 1090. | 1122. |

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WATER BALANCE

[illegible]

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ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

POWER IN MW

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | AVEYR | CALYR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| 1 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1950 |
| 2 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1951 |
| 3 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1952 |
| 4 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1953 |
| 5 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1954 |
| 6 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1955 |
| 7 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1956 |
| 8 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1957 |
| 9 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1958 |
| 10 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1959 |
| 11 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1960 |
| 12 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1961 |
| 13 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1962 |
| 14 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1963 |
| 15 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1964 |
| 16 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1965 |
| 17 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1966 |
| 18 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1967 |
| 19 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1968 |
| 20 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1969 |
| 21 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1970 |
| 22 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1971 |
| 23 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1972 |
| 24 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1973 |
| 25 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1974 |
| 26 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1975 |
| 27 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1976 |
| 28 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1977 |
| 29 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1978 |
| 30 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1979 |
| 31 | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | 1980 |
| MEAN | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | |
| MAX | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | |
| MIN | 124. | 120. | 118. | 124. | 136. | 155. | 178. | 194. | 178. | 169. | 151. | 136. | 149. | |

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ENERGY IN MWH

| YEAR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC | JAN | FEB | MAR | APR | TOTYR | CALYR |
|------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|--------|----------|-------|
| 1 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1950 |
| 2 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1951 |
| 3 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1952 |
| 4 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1953 |
| 5 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1954 |
| 6 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1955 |
| 7 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1956 |
| 8 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1957 |
| 9 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1958 |
| 10 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1959 |
| 11 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1960 |
| 12 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1961 |
| 13 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1962 |
| 14 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1963 |
| 15 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1964 |
| 16 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1965 |
| 17 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1966 |
| 18 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1967 |
| 19 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1968 |
| 20 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1969 |
| 21 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1970 |
| 22 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1971 |
| 23 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1972 |
| 24 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1973 |
| 25 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1974 |
| 26 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1975 |
| 27 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1976 |
| 28 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1977 |
| 29 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1978 |
| 30 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | 1979 |
| 31 | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | 1980 |
| MEAN | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 114286. | 112405. | 97623. | 1301051. | |
| MAX | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 117287. | 112405. | 97623. | 1304052. | |
| MIN | 92230. | 86466. | 87907. | 92230. | 97623. | 115288. | 128304. | 144110. | 132581. | 113242. | 112405. | 97623. | 1300008. | |

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ENERGY DEFICIT IN MWH

[illegible]

ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

AVERAGE GENERATION IN MW IN MONTHS OF SPILLS

[illegible]

PROJECT 14879001

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SURPLUS ENERGY IN MWH

[illegible]

ALTERNATIVE E: MCARTHUR SHORT TUNNEL, WITH FISH RELEASES

REMAINING SPILLS IN CFS

[illegible]

APPENDIX TO SECTION 8.0

ESTIMATE SUMMARIES

CHAKACHAMNA HYDROELECTRIC PROJECT
CONCEPTUAL ESTIMATE SUMMARIES – SHEET 1 OF 2

| ALTERNATIVES | ESTIMATED COSTS IN THOUSANDS OF DOLLARS | | | | | | | | | |
|---|---|---------|--------------|---------|--------------|---------|--------------|---------|--------------|---------|
| | A | | B | | C | | D | | E | |
| LAND AND LAND RIGHTS | Not included | 0 | Not included | 0 | Not included | 0 | Not included | 0 | Not included | |
| POWER PLANT STRUCTURE AND IMPROVEMENTS | | | | | | | | | | |
| Valve Chamber | 5,600 | | 5,500 | | 5,600 | | 5,600 | | 5,500 | |
| Underground Power House | 26,200 | | 25,200 | | 26,200 | | 26,200 | | 25,200 | |
| Bus Galleries | 200 | | 200 | | 200 | | 200 | | 200 | |
| Transformer Gallery | 4,600 | | 4,300 | | 4,300 | | 4,300 | | 4,300 | |
| Valve Chamber and Transformer Gallery – Access Tunnel | 400 | | 400 | | 400 | | 400 | | 400 | |
| P. H. Access Tunnel | 13,500 | | 13,500 | | 13,500 | | 13,500 | | 13,500 | |
| Cable Way | <u>800</u> | | <u>800</u> | | <u>800</u> | | <u>800</u> | | <u>800</u> | |
| | | 51,300 | | 49,900 | | 51,000 | | 51,000 | | 49,900 |
| RESERVOIR, DAM AND WATERWAYS | | | | | | | | | | |
| Reservoir | 100 | | 100 | | 100 | | 100 | | 100 | |
| Intake Structure | 10,400 | | 9,300 | | 10,400 | | 10,400 | | 9,300 | |
| Intake Gate Shaft | 13,200 | | 12,400 | | 13,200 | | 13,200 | | 17,600 | |
| Fish Facilities | — | | — | | — | | — | | 85,400 | |
| Dike & Spillway | — | | — | | — | | — | | 9,100 | |
| Access Tunnel | | | | | | | | | | |
| — At Intake | 21,600 | | 19,100 | | 21,600 | | 21,600 | | 0 | |
| — At Surge Chamber, No. 3 | 6,600 | | 5,900 | | 8,900 | | 8,900 | | 5,900 | |
| — At Mile 3, 5, No. 1 | 0 | | 0 | | 20,800 | | 20,800 | | 0 | |
| — At Mile 7, 5, No. 2 | 0 | | 0 | | 14,500 | | 14,500 | | 0 | |
| Power Tunnel | 626,800 | | 580,400 | | 712,500 | | 712,500 | | 447,800 | |
| Surge Chamber – Upper | 12,900 | | 11,000 | | 12,900 | | 12,900 | | 18,900 | |
| Penstock – Inclined Section | 18,000 | | 16,500 | | 15,400 | | 15,400 | | 0 | |
| — Horizontal Section and Elbow | 6,700 | | 6,000 | | 6,700 | | 6,700 | | 6,000 | |
| — Wye Branches to Valve Chamber | 13,200 | | 11,900 | | 12,100 | | 12,100 | | 11,900 | |
| — Between Valve Chamber & Power House | 800 | | 600 | | 800 | | 800 | | 600 | |
| Draft Tube Tunnels | 1,900 | | 1,700 | | 1,900 | | 1,900 | | 1,700 | |
| Surge Chamber – Tailrace | 2,400 | | 2,400 | | 2,400 | | 2,400 | | 2,400 | |
| Tailrace Tunnel and Structure | 10,300 | | 9,600 | | 10,300 | | 10,300 | | 9,600 | |
| Tailrace Channel | 900 | | 700 | | 900 | | 900 | | 700 | |
| River Training Works | 500 | | 500 | | 500 | | 500 | | 500 | |
| Miscellaneous Mechanical and Electrical | <u>7,100</u> | | <u>6,100</u> | | <u>5,700</u> | | <u>5,700</u> | | <u>6,100</u> | |
| | | 753,400 | | 694,200 | | 871,600 | | 871,600 | | 633,600 |

A, B – McArthur development, high level tunnel excavated by drilling and blasting
C, D – Chacackatna valley development excavated by drilling and blasting
E – Mc Arthur development, low level tunnel excavated by boring machine

CHAKACHAMNA HYDROELECTRIC PROJECT
CONCEPTUAL ESTIMATE SUMMARIES – SHEET 2 OF 2

| ALTERNATIVES | ESTIMATED COSTS IN THOUSANDS OF DOLLARS | | | | |
|---|---|-----------|-----------|-----------|----------------------|
| | A | B | C | D | E |
| TURBINES AND GENERATORS | 67,900 | 57,900 | 54,500 | 54,500 | 57,900 |
| ACCESSORY ELECTRICAL EQUIPMENT | 11,200 | 9,500 | 9,000 | 9,000 | 9,500 |
| MISCELLANEOUS POWER PLANT EQUIPMENT | 8,600 | 7,300 | 6,900 | 6,900 | 7,300 |
| SWITCHYARD STRUCTURES | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
| SWITCHYARD EQUIPMENT | 13,800 | 12,500 | 12,100 | 12,100 | 12,500 |
| COMM. SUPV. CONTROL EQUIPMENT | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |
| TRANSPORTATION FACILITIES | | | | | |
| Port | 4,600 | 4,600 | 4,600 | 4,600 | 4,600 |
| Airport | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Access and Construction Roads | 59,600 | 59,600 | 44,100 | 44,100 | 59,600 |
| | 66,200 | 66,200 | 50,700 | 50,700 | 66,200 |
| TRANSMISSION LINE & CABLE CROSSING | 63,200 | 63,200 | 56,500 | 56,500 | 63,200 |
| TOTAL SPECIFIC CONSTRUCTION COST AT JANUARY 1982 PRICE LEVELS | 1,040,800 | 965,900 | 1,117,500 | 1,117,500 | 905,300 |
| ENGINEERING & CONSTRUCTION MANAGEMENT | 124,900 | 115,900 | 134,100 | 134,100 | 108,700 |
| SUBTOTAL | 1,165,700 | 1,081,800 | 1,251,600 | 1,251,600 | 1,014,000 |
| CONTINGENCY @ 20% | 233,100 | 216,400 | 250,300 | 250,300 | 203,000 |
| ESCALATION | Not Incl. | Not Incl. | Not Incl. | Not Incl. | Not Incl. |
| INTEREST DURING CONST. @ 3% PER ANNUM | 111,900 | 104,100 | 101,400 | 101,400 | 97,400 |
| OWNER'S COSTS | Not Incl. | Not Incl. | Not Incl. | Not Incl. | Not Incl. |
| ALLOWANCE FOR FISH PASSAGE FACILITIES | — | 50,000 | — | 50,000 | Under Reservoir Item |
| TOTAL PROJECT COST AT JANUARY, 1982 PRICE LEVELS | 1,510,700 | 1,452,300 | 1,603,300 | 1,653,300 | 1,314,400 |
| USE | 1,500,000 | 1,450,000 | 1,600,000 | 1,650,000 | 1,314,000 |

A, B — McArthur development, high level tunnel excavated by drilling and blasting
C, D — Chacackatna valley development excavated by drilling and blasting
E — Mc Arthur development, low level tunnel excavated by boring machine

**ALTERNATIVE A
ESTIMATED COST**



ESTIMATE SUMMARY

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CHAKACHAMNA HYDROELECTRIC PROJECT
PROJECT

ALASKA POWER AUTHORITY

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DATE

SHEET 1 OF 15

ALTERNATIVE A

PREPARED FOR

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|----------------------------|
| | POWER PLANT STRUCTURE & IMPROVEMENTS | | | | | | |
| | Valve Chamber | | | | | | |
| | Excavation & Supports | 10,500 | CY | 270 | 2,835,000 | | |
| | Concrete & Reinf Steel | 6,520 | CY | 410 | 2,673,200 | | |
| | Struc. Steel & Misc. Metals | 52 | TON | 1,800 | 93,600 | | |
| | Round-Off | | | | (1,800) | 5,600,000 | |
| | | | | | | | |
| | | | | | | | |
| | Underground Powerhouse | | | | | | |
| | Dewatering | | LS | | 4,100,000 | | Entire Underground Complex |
| | Excavation & Supports | 64,000 | CY | 155 | 9,920,000 | | |
| | Drilling-Percus. & Rotary | 15,000 | LF | 30 | 450,000 | | 2" - 3"φ |
| | Concrete & Reinf. Steel | 14,200 | CY | 630 | 8,946,000 | | |
| | Struc. Steel & Misc Metals | 330 | TON | 5,300 | 1,749,000 | | |
| | Architectural | | LS | | 1,000,000 | | |
| | Round-Off | | | | 35,000 | | |
| | | | | | | 26,200,000 | |
| | | | | | | | |
| | | | | | | | |
| | Bus Galleries Between Powerhouse & Transformer Vaults | | | | | | |
| | Excavation & Supports | 200 | CY | 825 | 165,000 | | |
| | Concrete | 120 | CY | 290 | 34,800 | | |
| | Round Off | | | | 200 | | |
| | | | | | | 200,000 | |

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SHEET 2 OF 15

ALTERNATIVE A

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|------------|---------|
| | <u>Transformer Gallery & Tunnels</u> | | | | | | |
| | Excavation & Supports | 13,000 | CY | 280 | 3,640,000 | | |
| | Concrete & Reinf Steel | 900 | CY | 460 | 414,000 | | |
| | Struc Steel & Misc. Metals | 130 | TON | 3,800 | 494,000 | | |
| | Round Off | | | | 52,000 | | |
| | | | | | | 4,600,000 | |
| | <u>Valve Chamber & Transformer Gallery-Access Tunnels</u> | | | | | | |
| | Excavation & Supports | 1,500 | CY | 250 | 375,000 | | |
| | Concrete | 60 | CY | 290 | 17,400 | | |
| | Round-Off | | | | 7,600 | | |
| | | | | | | 400,000 | |
| | <u>Powerhouse Access Tunnel</u> | | | | | | |
| | Portal Excav. & Protection | 56,000 | CY | 10 | 560,000 | | |
| | Portal Conc. & Reinf. Steel | 1,000 | CY | 570 | 570,000 | | |
| | Tunnel Excav. & Supports | 24,000 | CY | 300 | 7,200,000 | | |
| | Tunnel Concrete | 900 | CY | 290 | 261,000 | | |
| | Tunnel Misc. Metals | 30 | TON | 11,000 | 330,000 | | |
| | Subsurface Exploration | | | | | | |
| | Mobilization | | LS | | 1,500,000 | | |
| | Exploratory Adit | 1,000 | LF | 1,800 | 1,800,000 | | |
| | Core drilling | 5,000 | LF | 140 | 700,000 | | |
| | Helicopter Service | | LS | | 600,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 13,500,000 | |



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ALTERNATIVE A

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-----------|------------|---------|
| | <u>RESERVOIR, DAM & WATERWAYS</u> | | | | | | |
| | <u>Reservoir</u> | | | | | | |
| | Water Level Recording | | LS | | | 100,000 | |
| | <u>Intake Structure</u> | | | | | | |
| | Site Exploration | | | | | | |
| | Mobilization | | LS | | 150,000 | | |
| | Core Drilling | 5,000 | LF | 80 | 400,000 | | |
| | Helicopter Service | | LS | | 150,000 | | |
| | Tunnel Excav. & Supports | 12,000 | CY | 470 | 5,640,000 | | |
| | Tunnel Conc. & Reinf. Steel | 100 | CY | 350 | 35,000 | | |
| | Lake-Tap (Final Round) | | LS | | 3,000,000 | | L = 26' |
| | Place & Remove Temp. Conc | 600 | CY | 700 | 420,000 | | |
| | Diving Crew | 60 | DAYS | 10,000 | 600,000 | | |
| | Round-Off | | | | 5,000 | | |
| | | | | | | 10,400,000 | |
| | <u>Intake Gate Shaft</u> | | | | | | |
| | Shaft Excav. & Supports | 10,000 | CY | 360 | 3,600,000 | | |
| | Mass Surface Excav. | 50,000 | CY | 30 | 1,500,000 | | |
| | Concrete & Reinf. Steel | 5,700 | CY | 890 | 5,073,000 | | |
| | Misc. Metals, Gates & Hoist | 244 | TON | 12,500 | 3,050,000 | | |
| | Round-Off | | | | (23,000) | | |
| | | | | | | 13,200,000 | |



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ALTERNATIVE A

PREPARED FOR

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-------------|-------------|---------|
| | <u>Access Tunnel at Intake</u> | | | | | | |
| | Portal Excav. & Protection | 6,000 | CY | 50 | 300,000 | | |
| | Tunnel Excav. & Supports | 72,000 | CY | 295 | 21,240,000 | | |
| | Tunnel Conc. & Reinf. Steel | 200 | CY | 500 | 100,000 | | |
| | Round-Off | | | | (40,000) | | |
| | | | | | | 21,600,000 | |
| | | | | | | | |
| | | | | | | | |
| | <u>Access Tunnel at Surge Chamber</u> | | | | | | |
| | Portal Excav. & Protection | 6,000 | CY | 35 | 210,000 | | |
| | Tunnel Excav. & Supports | 17,000 | CY | 295 | 5,015,000 | | |
| | Tunnel Conc. & Reinf. Steel | 2,000 | CY | 420 | 840,000 | | |
| | Grouting Contact & Pressure | 2,500 | CF | 58 | 145,000 | | |
| | Watertight Bulkhead & Frame | 27 | TON | 13,800 | 372,600 | | |
| | Round-Off | | | | 17,400 | 6,600,000 | |
| | | | | | | | |
| | | | | | | | |
| | <u>Power Tunnel</u> | | | | | | |
| | Excavation & Supports | 53,400 | LF | 8,800 | 469,920,000 | | |
| | Concrete | 410,000 | CY | 334 | 136,940,000 | | |
| | Grouting Contact & Pressure | 370,000 | CF | 54 | 19,980,000 | | |
| | Round-Off | | | | (40,000) | | |
| | | | | | | 626,800,000 | |
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ALTERNATIVE A

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|------------------------------|
| | <u>Surge Chamber - Upper</u> | | | | | | |
| | Excavation & Supports | 35,500 | CY | 200 | 7,100,000 | | |
| | Concrete & Reinf. Steel | 6,100 | CY | 880 | 5,368,000 | | |
| | Earthworks & Fencing | 15,000 | CY | 27 | 405,000 | | Heliport, Storage, Work Area |
| | Round-Off | | | | 27,000 | | |
| | | | | | | 12,900,000 | |
| | <u>Penstock-Inclined Section</u> | | | | | | |
| | Excavation & Supports | 27,000 | CY | 280 | 7,560,000 | | |
| | Concrete & Reinf. Steel | 12,000 | CY | 845 | 10,140,000 | | |
| | Grouting Contact & Pressure | 6,200 | CF | 52 | 322,400 | | |
| | Round-Off | | | | (22,400) | | |
| | | | | | | 18,000,000 | |
| | <u>Penstock-Horizontal Section & Elbow</u> | | | | | | |
| | Excavation & Supports | 14,000 | CY | 310 | 4,340,000 | | |
| | Concrete & Reinf. Steel | 6,000 | CY | 365 | 2,190,000 | | |
| | Grouting - Contact | 3,000 | CF | 50 | 150,000 | | |
| | Round-Off | | | | 20,000 | | |
| | | | | | | 6,700,000 | |



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SHEET 7 OF 15

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|---------|
| | <u>Penstock-Wye Branches to Valve Chamber</u> | | | | | | |
| | Excavation & Supports | 10,000 | CY | 440 | 4,400,000 | | |
| | Concrete & Reinf. Steel | 7,200 | CY | 608 | 4,377,600 | | |
| | Steel Liner | 850 | TON | 5,000 | 4,250,000 | | |
| | Grouting-Contact | 3,000 | CY | 50 | 150,000 | | |
| | Round-Off | | | | 22,400 | | |
| | | | | | | 13,200,000 | |
| | <u>Penstock Between Valve Chamber & Powerhouse</u> | | | | | | |
| | Excavation & Supports | 1,000 | CY | 440 | 440,000 | | |
| | Concrete & Backfill | 600 | CY | 550 | 330,000 | | |
| | Round-Off | | | | 30,000 | | |
| | | | | | | 800,000 | |
| | <u>Draft Tube Tunnels</u> | | | | | | |
| | Rock Bolts & Grout | 19,000 | LF | 27 | 513,000 | | |
| | Concrete & Reinf. Steel | 3,300 | CY | 425 | 1,402,500 | | |
| | Round-Off | | | | (15,500) | | |
| | | | | | | 1,900,000 | |
| | <u>Surge Chamber - Tailrace</u> | | | | | | |
| | Excavation & Supports | 5,000 | CY | 480 | | 2,400,000 | |
| | | | | | | | |
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SHEET 8 OF 15

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|-------------|---------|
| | <u>Tailrace Tunnel & Structures</u> | | | | | | |
| | Cofferdam & Dewatering | | LS | | 2,000,000 | | |
| | Portal Excav. & Protection | 2,000 | CY | 65 | 130,000 | | |
| | Concrete & Reinf. Steel | 1,200 | CY | 600 | 720,000 | | |
| | Walkway Bridge | | LS | | 65,000 | | |
| | Stoplogs & Hoists | 81 | TON | 8,500 | 688,500 | | |
| | Tunnel Excav. & Supports | 25,000 | CY | 260 | 6,500,000 | | |
| | Plug Excavation | 4,000 | CY | 50 | 200,000 | | |
| | Round-Off | | | | (3,500) | | |
| | | | | | | 10,300,000 | |
| | <u>Tailrace Channel</u> | | | | | | |
| | Channel Excavation | 100,000 | CY | 9 | | 900,000 | |
| | <u>River Training Works</u> | | | | | | |
| | River Bed Deepening | 50,000 | CY | 10 | | 500,000 | |
| | <u>Mech & Elec.</u> | | LS | | | 7,100,000 | |
| | <u>TOTAL RESERVOIR, DAM AND WATERWAYS</u> | | | | | 753,400,000 | |

PREPARED BY

MF

CHECKED BY

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CHAKACHAMNA HYDROELECTRIC PROJECT

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|-----------|------|------------|-----------|------------|----------|
| | <u>Access & Construction Roads</u> | | | | | | |
| | <u>Mile 0+00 to 18+00</u> | | | | | | |
| | Earthwork | 175,000 | CY | 6.60 | 1,155,000 | | |
| | Culverts | 1,500 | LF | 65 | 97,500 | | 36"Ø CMP |
| | Bridges | 1,400 | SF | 150 | 210,000 | | |
| | Subbase & Base | 85,400 | CY | 15 | 1,281,000 | | |
| | Guard Rail | 1,200 | LF | 25 | 30,000 | | |
| | Repair Existing Road | 95,000 | LF | 10 | 950,000 | | |
| | Snow Fences | 5,000 | LF | 35 | 175,000 | | |
| | Round-Off | | | | 1,500 | | |
| | | | | | | 3,900,000 | |
| | <u>Mile 18+00 to 35+00</u> | | | | | | |
| | Earthworks | 1,465,000 | CY | 6.60 | 9,669,000 | | |
| | Culverts | 3,600 | LF | 80 | 288,000 | | 48"Ø CMP |
| | Subbase & Base | 165,000 | CY | 15 | 2,475,000 | | |
| | Guard Rail | 13,000 | LF | 25 | 325,000 | | |
| | Repair Existing Road | 16,000 | LF | 10 | 160,000 | | |
| | Snow Fences | 1,000 | LF | 35 | 35,000 | | |
| | Round-Off | | | | 48,000 | | |
| | | | | | | 13,000,000 | |
| | <u>Mile 35+00 to 39+00</u> | | | | | | |
| | Earthwork | 445,000 | CY | 8.30 | 3,693,500 | | |
| | Culverts | 1,000 | LF | 80 | 80,000 | | 48"Ø CMP |
| | Bridge | 9,000 | SF | 150 | 1,350,000 | | |
| | Subbase & Base | 38,000 | CY | 15 | 570,000 | | |
| | Guard Rail | 10,000 | LF | 27 | 270,000 | | |
| | Snow Fences | 2,000 | LF | 35 | 70,000 | | |
| | Round-Off | | | | (33,500) | | |
| | | | | | | 6,000,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------|----------|------|------------|-----------|-----------|-------------------|
| | Walkway To Gate Shaft | | | | | | |
| | Earthwork | 1,200 | CY | 20 | 24,000 | | |
| | Guard Rail | 1,000 | LF | 25 | 25,000 | | |
| | Bridge | 200 | SF | 150 | 30,000 | | |
| | Riprap | 100 | CY | 35 | 3,500 | | |
| | Round-Off | | | | 17,500 | | |
| | | | | | | 100,000 | |
| | Access Road to MacArthur Valley | | | | | | |
| | Earthwork | 545,000 | CY | 7 | 3,815,000 | | |
| | Culverts | 2,400 | LF | 75 | 180,000 | | 36"ø and 48"ø CMP |
| | Bridge Improvements | 9,000 | SF | 70 | 630,000 | | |
| | Subbase & Base | 105,000 | CY | 15 | 1,575,000 | | |
| | Guard Rail | 6,000 | LF | 25 | 150,000 | | |
| | Snow Fences | 3,000 | LF | 35 | 105,000 | | |
| | Round-Off | | | | 45,000 | | |
| | | | | | | 6,500,000 | |
| | Access Road to Tailrace Tunnel | | | | | | |
| | Earthwork | 56,000 | CY | 8 | 448,000 | | |
| | Culverts | 100 | LF | 80 | 8,000 | | 48"ø CMP |
| | Subbase & Base | 2,500 | CY | 20 | 50,000 | | |
| | Guard Rail | 600 | LF | 25 | 15,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 500,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|----------|
| | Access Road to Downstream Power Tunnel | | | | | | |
| | Earthwork | 215,000 | CY | 9.80 | 2,107,000 | | |
| | Culverts | 800 | LF | 80 | 64,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Subbase & Base | 10,000 | CY | 21 | 210,000 | | |
| | Guardrail | 9,000 | LF | 32 | 288,000 | | |
| | Snowshed & Slide Fall | 1,000 | LF | 800 | 800,000 | | |
| | Round-Off | | | | (19,000) | | |
| | | | | | | 3,900,000 | |
| | Temporary Construction Roads | | | | | | |
| | Earthwork | 61,000 | CY | 6 | 366,000 | | |
| | Culverts | 600 | LF | 80 | 48,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Guardrail | 2,000 | LF | 25 | 50,000 | | |
| | Round-Off | | | | (14,000) | | |
| | | | | | | 900,000 | |
| | Road Maintenance | | | | | | |
| | Summer Season | 45 | MO | 150,000 | 6,750,000 | | |
| | Winter Season | 30 | MO | 600,000 | 18,000,000 | | |
| | Round-Off | | | | 50,000 | | |
| | | | | | | 24,800,000 | |
| | TOTAL ACCESS & CONSTRUCTION ROADS | | | | | 59,600,000 | |

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**ALTERNATIVE B
ESTIMATED COST**



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|----------------------------|
| | POWER PLANT STRUCTURE & IMPROVEMENTS | | | | | | |
| | Valve Chamber | | | | | | |
| | Excavation & Supports | 10,000 | CY | 275 | 2,750,000 | | |
| | Concrete & Reinf Steel | 6,520 | CY | 410 | 2,673,200 | | |
| | Struc. Steel & Misc. Metals | 52 | TON | 1,800 | 93,600 | | |
| | Round-Off | | | | (16,800) | | |
| | | | | | | 5,500,000 | |
| | Underground Powerhouse | | | | | | |
| | Dewatering | | LS | | 4,100,000 | | Entire Underground Complex |
| | Excavation & Supports | 58,900 | CY | 168 | 9,895,200 | | |
| | Drilling-Percus. & Rotary | 12,700 | LF | 27 | 342,900 | | 2" - 3"φ |
| | Concrete & Reinf. Steel | 13,100 | CY | 630 | 8,253,000 | | |
| | Struc. Steel & Misc Metals | 300 | TON | 5,300 | 1,590,000 | | |
| | Architectural | | LS | | 1,000,000 | | |
| | Round-Off | | | | 18,900 | | |
| | | | | | | 25,200,000 | |
| | Bus Galleries Between Powerhouse & Transformer Vaults | | | | | | |
| | Excavation & Supports | 200 | CY | 825 | 165,000 | | |
| | Concrete | 120 | CY | 290 | 34,800 | | |
| | Round Off | | | | 200 | | |
| | | | | | | 200,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|------------|---------|
| | <u>Transformer Gallery & Tunnels</u> | | | | | | |
| | Excavation & Supports | 11,960 | CY | 290 | 3,468,400 | | |
| | Concrete & Reinf Steel | 830 | CY | 460 | 381,800 | | |
| | Struc Steel & Misc.Metals | 120 | TON | 3,800 | 456,000 | | |
| | Round Off | | | | (6,200) | | |
| | | | | | | 4,300,000 | |
| | <u>Valve Chamber & Transformer Gallery-Access Tunnels</u> | | | | | | |
| | Excavation & Supports | 1,500 | CY | 250 | 375,000 | | |
| | Concrete | 60 | CY | 290 | 17,400 | | |
| | Round-Off | | | | 7,600 | | |
| | | | | | | 400,000 | |
| | <u>Powerhouse Access Tunnel</u> | | | | | | |
| | Portal Excav.& Protection | 56,000 | CY | 10 | 560,000 | | |
| | Portal Conc.& Reinf.Steel | 1,000 | CY | 570 | 570,000 | | |
| | Tunnel Excav.& Supports | 24,000 | CY | 300 | 7,200,000 | | |
| | Tunnel Concrete | 900 | CY | 290 | 261,000 | | |
| | Tunnel Misc. Metals | 30 | TON | 11,000 | 330,000 | | |
| | Subsurface Exploration | | | | | | |
| | Mobilization | | LS | | 1,500,000 | | |
| | Exploratory Adit | 1,000 | LF | 1,800 | 1,800,000 | | |
| | Core drilling | 5,000 | LF | 140 | 700,000 | | |
| | Helicopter Service | | LS | | 600,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 13,500,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-----------|------------|---------|
| | <u>RESERVOIR, DAM & WATERWAYS</u> | | | | | | |
| | <u>Reservoir</u> | | | | | | |
| | Water Level Recording | | LS | | | 100,000 | |
| | <u>Intake Structure</u> | | | | | | |
| | Site Exploration | | | | | | |
| | Mobilization | | LS | | 150,000 | | |
| | Core Drilling | 5,000 | LF | 80 | 400,000 | | |
| | Helicopter Service | | LS | | 150,000 | | |
| | Tunnel Excav. & Supports | 10,000 | CY | 510 | 5,100,000 | | |
| | Tunnel Conc. & Reinf. Steel | 90 | CY | 350 | 31,500 | | |
| | Lake-Tap (Final Round) | | LS | | 2,500,000 | | L = 26' |
| | Place & Remove Temp. Conc. | 550 | CY | 700 | 385,000 | | |
| | Diving Crew | 60 | DAYS | 10,000 | 600,000 | | |
| | Round-Off | | | | (16,500) | | |
| | | | | | | 9,300,000 | |
| | <u>Intake Gate Shaft</u> | | | | | | |
| | Shaft Excav. & Supports | 10,000 | CY | 360 | 3,600,000 | | |
| | Mass Surface Excav. | 50,000 | CY | 30 | 1,500,000 | | |
| | Concrete & Reinf. Steel | 5,200 | CY | 890 | 4,628,000 | | |
| | Misc. Metals, Gates & Hoist | 220 | TON | 12,200 | 2,684,000 | | |
| | Round-Off | | | | (12,000) | | |
| | | | | | | 12,400,000 | |



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|-----|---------------------------------------|----------|------|------------|-------------|-------------|---------|
| | <u>Access Tunnel at Intake</u> | | | | | | |
| | Portal Excav. & Protection | 6,000 | CY | 50 | 300,000 | | |
| | Tunnel Excav. & Supports | 60,000 | CY | 312 | 18,720,000 | | |
| | Tunnel Conc. & Reinf. Steel | 170 | CY | 500 | 85,000 | | |
| | Round-Off | | | | (5,000) | | |
| | | | | | | 19,100,000 | |
| | <u>Access Tunnel at Surge Chamber</u> | | | | | | |
| | Portal Excav. & Protection | 6,000 | CY | 35 | 210,000 | | |
| | Tunnel Excav. & Supports | 14,000 | CY | 317 | 4,438,000 | | |
| | Tunnel Conc. & Reinf. Steel | 1,700 | CY | 420 | 714,000 | | |
| | Grouting Contact & Pressure | 2,260 | CF | 58 | 131,080 | | |
| | Watertight Bulkhead & Frame | 27 | TON | 13,800 | 372,600 | | |
| | Round-Off | | | | 34,320 | | |
| | | | | | | 5,900,000 | |
| | <u>Power Tunnel</u> | | | | | | |
| | Excavation & Supports | 53,400 | LF | 8,372 | 447,064,800 | | |
| | Concrete | 348,000 | CY | 334 | 116,232,000 | | |
| | Grouting Contact & Pressure | 317,000 | CF | 54 | 17,118,000 | | |
| | Round-Off | | | | (14,800) | | |
| | | | | | | 580,400,000 | |



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|-----|---|----------|------|------------|-----------|-------------|---------|
| | <u>Tailrace Tunnel & Structures</u> | | | | | | |
| | Cofferdam & Dewatering | | LS | | 2,000,000 | | |
| | Portal Excav. & Protection | 2,000 | CY | 65 | 130,000 | | |
| | Concrete & Reinf. Steel | 1,200 | CY | 600 | 720,000 | | |
| | Walkway Bridge | | LS | | 65,000 | | |
| | Stoplogs & Hoists | 81 | TON | 8,500 | 688,500 | | |
| | Tunnel Excav. & Supports | 20,000 | CY | 290 | 5,800,000 | | |
| | Plug Excavation | 4,000 | CY | 50 | 200,000 | | |
| | Round-Off | | | | (3,500) | | |
| | | | | | | 9,600,000 | |
| | <u>Tailrace Channel</u> | | | | | | |
| | Channel Excavation | 80,000 | CY | 9 | 720,000 | | |
| | | | | | (20,000) | | |
| | | | | | | 700,000 | |
| | <u>River Training Works</u> | | | | | | |
| | River Bed Deepening | 50,000 | CY | 10 | | 500,000 | |
| | Mech & Elec. | | LS | | | 6,100,000 | |
| | <u>TOTAL RESERVOIR, DAM AND WATERWAYS</u> | | | | | 694,200,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|------------|------------|---------|
| | <u>Turbines & Generators</u> | | | | | | 330 MW |
| | Turbines | 4 | EA | 8,480,000 | 33,920,000 | | |
| | Generators | 4 | EA | 6,000,000 | 24,000,000 | | |
| | Round-Off | | | | (20,000) | | |
| | | | | | | 57,900,000 | |
| | <u>Accessory Electrical Equipment</u> | | | | | | |
| | Equipment | | LS | | | 9,500,000 | |
| | <u>Misc. Power Plant Equipment</u> | | | | | | |
| | Crane Bridge | 1 | EA | | 930,000 | | |
| | Other Power Plant Equip. | | LS | | 6,370,000 | 7,300,000 | |
| | <u>Switchyard Structures</u> | | | | | | |
| | Earthworks | 15,000 | CY | 25 | 375,000 | | |
| | Concrete & Reinf. Steel | 3,800 | CY | 640 | 2,432,000 | | |
| | Struc. Steel & Misc. Metals | 225 | TON | 3,500 | 787,500 | | |
| | Round-Off | | | | 5,500 | | |
| | | | | | | 3,600,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|-----------|------|------------|-----------|------------|----------|
| | <u>Access & Construction Roads</u> | | | | | | |
| | <u>Mile 0+00 to 18+00</u> | | | | | | |
| | Earthwork | 175,000 | CY | 6.60 | 1,155,000 | | |
| | Culverts | 1,500 | LF | 65 | 97,500 | | 36"Ø CMP |
| | Bridges | 1,400 | SF | 150 | 210,000 | | |
| | Subbase & Base | 85,400 | CY | 15 | 1,281,000 | | |
| | Guard Rail | 1,200 | LF | 25 | 30,000 | | |
| | Repair Existing Road | 95,000 | LF | 10 | 950,000 | | |
| | Snow Fences | 5,000 | LF | 35 | 175,000 | | |
| | Round-Off | | | | 1,500 | | |
| | | | | | | 3,900,000 | |
| | <u>Mile 18+00 to 35+00</u> | | | | | | |
| | Earthworks | 1,465,000 | CY | 6.60 | 9,669,000 | | |
| | Culverts | 3,600 | LF | 80 | 288,000 | | 48"Ø CMP |
| | Subbase & Base | 165,000 | CY | 15 | 2,475,000 | | |
| | Guard Rail | 13,000 | LF | 25 | 325,000 | | |
| | Repair Existing Road | 16,000 | LF | 10 | 160,000 | | |
| | Snow Fences | 1,000 | LF | 35 | 35,000 | | |
| | Round-Off | | | | 48,000 | | |
| | | | | | | 13,000,000 | |
| | <u>Mile 35+00 to 39+00</u> | | | | | | |
| | Earthwork | 445,000 | CY | 8.30 | 3,693,500 | | |
| | Culverts | 1,000 | LF | 80 | 80,000 | | 48"Ø CMP |
| | Bridge | 9,000 | SF | 150 | 1,350,000 | | |
| | Subbase & Base | 38,000 | CY | 15 | 570,000 | | |
| | Guard Rail | 10,000 | LF | 27 | 270,000 | | |
| | Snow Fences | 2,000 | LF | 35 | 70,000 | | |
| | Round-Off | | | | (33,500) | | |
| | | | | | | 6,000,000 | |



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|-----|---------------------------------|----------|------|------------|-----------|-----------|-------------------|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | Walkway To Gate Shaft | | | | | | |
| | Earthwork | 1,200 | CY | 20 | 24,000 | | |
| | Guard Rail | 1,000 | LF | 25 | 25,000 | | |
| | Bridge | 200 | SF | 150 | 30,000 | | |
| | Riprap | 100 | CY | 35 | 3,500 | | |
| | Round-Off | | | | 17,500 | | |
| | | | | | | 100,000 | |
| | | | | | | | |
| | | | | | | | |
| | Access Road to MacArthur Valley | | | | | | |
| | Earthwork | 545,000 | CY | 7 | 3,815,000 | | |
| | Culverts | 2,400 | LF | 75 | 180,000 | | 36"φ and 48"φ CMP |
| | Bridge Improvements | 9,000 | SF | 70 | 630,000 | | |
| | Subbase & Base | 105,000 | CY | 15 | 1,575,000 | | |
| | Guard Rail | 6,000 | LF | 25 | 150,000 | | |
| | Snow Fences | 3,000 | LF | 35 | 105,000 | | |
| | Round-Off | | | | 45,000 | | |
| | | | | | | 6,500,000 | |
| | | | | | | | |
| | | | | | | | |
| | Access Road to Tailrace Tunnel | | | | | | |
| | Earthwork | 56,000 | CY | 8 | 448,000 | | |
| | Culverts | 100 | LF | 80 | 8,000 | | 48"φ CMP |
| | Subbase & Base | 2,500 | CY | 20 | 50,000 | | |
| | Guard Rail | 600 | LF | 25 | 15,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 500,000 | |
| | | | | | | | |
| | | | | | | | |
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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|----------|
| | Access Road to Downstream Power Tunnel | | | | | | |
| | Earthwork | 215,000 | CY | 9.80 | 2,107,000 | | |
| | Culverts | 800 | LF | 80 | 64,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Subbase & Base | 10,000 | CY | 21 | 210,000 | | |
| | Guardrail | 9,000 | LF | 32 | 288,000 | | |
| | Snowshed & Slide Fall | 1,000 | LF | 800 | 800,000 | | |
| | Round-Off | | | | (19,000) | | |
| | | | | | | 3,900,000 | |
| | Temporary Construction Roads | | | | | | |
| | Earthwork | 61,000 | CY | 6 | 366,000 | | |
| | Culverts | 600 | LF | 80 | 48,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Guardrail | 2,000 | LF | 25 | 50,000 | | |
| | Round-Off | | | | (14,000) | | |
| | | | | | | 900,000 | |
| | Road Maintenance | | | | | | |
| | Summer Season | 45 | MO | 150,000 | 6,750,000 | | |
| | Winter Season | 30 | MO | 600,000 | 18,000,000 | | |
| | Round-Off | | | | 50,000 | | |
| | | | | | | 24,800,000 | |
| | TOTAL ACCESS & CONSTRUCTION ROADS | | | | | 59,600,000 | |



JOB NO.

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**ALTERNATIVE C
ESTIMATED COST**



ESTIMATE SUMMARY

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CHAKACHAMNA HYDROELECTRIC PROJECT PROJECT

ALASKA POWER AUTHORITY

ALTERNATIVE C

PREPARED FOR

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|----------------------------|
| | POWER PLANT STRUCTURE & IMPROVEMENTS | | | | | | |
| | Valve Chamber | | | | | | |
| | Excavation & Supports | 10,500 | CY | 270 | 2,835,000 | | |
| | Concrete & Reinf Steel | 6,520 | CY | 410 | 2,673,200 | | |
| | Struc. Steel & Misc. Metals | 52 | TON | 1,800 | 93,600 | | |
| | Round-Off | | | | (1,800) | | |
| | | | | | | 5,600,000 | |
| | | | | | | | |
| | | | | | | | |
| | Underground Powerhouse | | | | | | |
| | Dewatering | | LS | | 4,100,000 | | Entire Underground Complex |
| | Excavation & Supports | 64,000 | CY | 155 | 9,920,000 | | |
| | Drilling-Percus. & Rotary | 15,000 | LF | 30 | 450,000 | | 2" - 3" ϕ |
| | Concrete & Reinf. Steel | 14,200 | CY | 630 | 8,946,000 | | |
| | Struc. Steel & Misc Metals | 330 | TON | 5,300 | 1,749,000 | | |
| | Architectural | | LS | | 1,000,000 | | |
| | Round-Off | | | | 35,000 | | |
| | | | | | | 26,200,000 | |
| | | | | | | | |
| | | | | | | | |
| | Bus Galleries Between Powerhouse & Transformer Vaults | | | | | | |
| | Excavation & Supports | 200 | CY | 825 | 165,000 | | |
| | Concrete | 120 | CY | 290 | 34,800 | | |
| | Round Off | | | | 200 | | |
| | | | | | | 200,000 | |

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ALASKA POWER AUTHORITY

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ALTERNATIVE C

| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|------------|---------|
| | <u>Transformer Gallery & Tunnels</u> | | | | | | |
| | Excavation & Supports | 11,960 | CY | 290 | 3,468,400 | | |
| | Concrete & Reinf Steel | 830 | CY | 460 | 381,800 | | |
| | Struc Steel & Misc.Metals | 120 | TON | 3,800 | 456,000 | | |
| | Round Off | | | | (6,200) | | |
| | | | | | | 4,300,000 | |
| | <u>Valve Chamber & Transformer Gallery-Access Tunnels</u> | | | | | | |
| | Excavation & Supports | 1,500 | CY | 250 | 375,000 | | |
| | Concrete | 60 | CY | 290 | 17,400 | | |
| | Round-Off | | | | 7,600 | | |
| | | | | | | 400,000 | |
| | <u>Powerhouse Access Tunnel</u> | | | | | | |
| | Portal Excav.& Protection | 56,000 | CY | 10 | 560,000 | | |
| | Portal Conc.& Reinf.Steel | 1,000 | CY | 570 | 570,000 | | |
| | Tunnel Excav.& Supports | 24,000 | CY | 300 | 7,200,000 | | |
| | Tunnel Concrete | 900 | CY | 290 | 261,000 | | |
| | Tunnel Misc. Metals | 30 | TON | 11,000 | 330,000 | | |
| | Subsurface Exploration | | | | | | |
| | Mobilization | | LS | | 1,500,000 | | |
| | Exploratory Adit | 1,000 | LF | 1,800 | 1,800,000 | | |
| | Core drilling | 5,000 | LF | 140 | 700,000 | | |
| | Helicopter Service | | LS | | 600,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 13,500,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-----------|------------|---------|
| | <u>RESERVOIR, DAM & WATERWAYS</u> | | | | | | |
| | <u>Reservoir</u> | | | | | | |
| | Water Level Recording | | LS | | | 100,000 | |
| | <u>Intake Structure</u> | | | | | | |
| | Site Exploration | | | | | | |
| | Mobilization | | LS | | 150,000 | | |
| | Core Drilling | 5,000 | LF | 80 | 400,000 | | |
| | Helicopter Service | | LS | | 150,000 | | |
| | Tunnel Excav. & Supports | 12,000 | CY | 470 | 5,640,000 | | |
| | Tunnel Conc. & Reinf. Steel | 100 | CY | 350 | 35,000 | | |
| | Lake-Tap (Final Round) | | LS | | 3,000,000 | | L = 26' |
| | Place & Remove Temp. Conc | 600 | CY | 700 | 420,000 | | |
| | Diving Crew | 60 | DAYS | 10,000 | 600,000 | | |
| | Round-Off | | | | 5,000 | | |
| | | | | | | 10,400,000 | |
| | <u>Intake Gate Shaft</u> | | | | | | |
| | Shaft Excav. & Supports | 10,000 | CY | 360 | 3,600,000 | | |
| | Mass Surface Excav. | 50,000 | CY | 30 | 1,500,000 | | |
| | Concrete & Reinf. Steel | 5,700 | CY | 890 | 5,073,000 | | |
| | Misc. Metals, Gates & Hoist | 244 | TON | 12,500 | 3,050,000 | | |
| | Round-Off | | | | (23,000) | | |
| | | | | | | 13,200,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-------------|-------------|---------|
| | <u>Access Tunnel at Mile 3.5 No.1</u> | | | | | | |
| | Portal Excav & Protection | 6,000 | CY | 53 | 318,000 | | |
| | Tunnel Excav & Supports | 68,000 | CY | 297 | 20,196,000 | | |
| | Tunnel Conc & Reinf Steel | 500 | CY | 430 | 215,000 | | |
| | Grouting-Contact & Pressure | 1,125 | CF | 58 | 65,250 | | |
| | Round-Off | | | | 5,750 | | |
| | | | | | | 20,800,000 | |
| | <u>Access Tunnel at Mile 7.5 No.2</u> | | | | | | |
| | Portal Excav & Protection | 6,000 | CY | 54 | 324,000 | | |
| | Tunnel Excav & Supports | 45,000 | CY | 298 | 13,410,000 | | |
| | Tunnel Conc & Reinf Steel | 1,600 | CY | 420 | 672,000 | | |
| | Grouting-Contact & Pressure | 2,300 | CF | 58 | 133,400 | | |
| | Round-Off | | | | (39,400) | | |
| | | | | | | 14,500,000 | |
| | <u>Power Tunnel</u> | | | | | | |
| | Excavation & Supports | 67,000 | LF | 7,698 | 515,766,000 | | |
| | Concrete | 514,000 | CY | 334 | 171,676,000 | | |
| | Grouting-Contact & Pressure | 464,000 | CF | 54 | 25,056,000 | | |
| | Round-Off | | | | 2,000 | | |
| | | | | | | 712,500,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|-------------|---------|
| | <u>Tailrace Tunnel & Structures</u> | | | | | | |
| | Cofferdam & Dewatering | | LS | | 2,000,000 | | |
| | Portal Excav. & Protection | 2,000 | CY | 65 | 130,000 | | |
| | Concrete & Reinf. Steel | 1,200 | CY | 600 | 720,000 | | |
| | Walkway Bridge | | LS | | 65,000 | | |
| | Stoplogs & Hoists | 81 | TON | 8,500 | 688,500 | | |
| | Tunnel Excav. & Supports | 25,000 | CY | 260 | 6,500,000 | | |
| | Plug Excavation | 4,000 | CY | 50 | 200,000 | | |
| | Round-Off | | | | (3,500) | | |
| | | | | | | 10,300,000 | |
| | <u>Tailrace Channel</u> | | | | | | |
| | Channel Excavation | 100,000 | CY | 9 | | 900,000 | |
| | <u>River Training Works</u> | | | | | | |
| | River Bed Deepening | 50,000 | CY | 10 | | 500,000 | |
| | <u>Mech & Elec.</u> | | LS | | | 5,700,000 | |
| | <u>TOTAL RESERVOIR, DAM AND WATERWAYS</u> | | | | | 871,600,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|-----------|------|------------|-----------|------------|----------|
| | <u>Access & Construction Roads</u> | | | | | | |
| | Mile 0+00 to 18+00 | | | | | | |
| | Earthwork | 175,000 | CY | 6.60 | 1,155,000 | | |
| | Culverts | 1,500 | LF | 65 | 97,500 | | |
| | Bridges | 1,400 | SF | 150 | 210,000 | | |
| | Subbase & Base | 85,400 | CY | 15 | 1,281,000 | | |
| | Guard Rail | 1,200 | LF | 25 | 30,000 | | |
| | Repair Existing Road | 95,000 | LF | 10 | 950,000 | | |
| | Snow Fences | 5,000 | LF | 35 | 175,000 | | |
| | Round-Off | | | | 1,500 | 3,900,000 | |
| | Mile 18+00 to 35+00 | | | | | | |
| | Earthworks | 1,465,000 | CY | 6.60 | 9,669,000 | | |
| | Culverts | 3,600 | LF | 80 | 288,000 | | 48"Ø CMP |
| | Subbase & Base | 165,000 | CY | 15 | 2,475,000 | | |
| | Guard Rail | 13,000 | LF | 25 | 325,000 | | |
| | Repair Existing Road | 16,000 | LF | 10 | 160,000 | | |
| | Snow Fences | 1,000 | LF | 35 | 35,000 | | |
| | Round-Off | | | | 48,000 | 13,000,000 | |
| | Mile 35+00 to 39+00 | | | | | | |
| | Earthwork | 445,000 | CY | 8.30 | 3,693,500 | | |
| | Culverts | 1,000 | LF | 80 | 80,000 | | 48"Ø CMP |
| | Bridge | 9,000 | SF | 150 | 1,350,000 | | |
| | Subbase & Base | 38,000 | CY | 15 | 570,000 | | |
| | Guard Rail | 10,000 | LF | 27 | 270,000 | | |
| | Snow Fences | 2,000 | LF | 35 | 70,000 | | |
| | Round-Off | | | | (33,500) | 6,000,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|----------------|
| | Access Road to Downstream Power Tunnel | | | | | | |
| | Earthwork | 215,000 | CY | 9.80 | 2,107,000 | | |
| | Culverts | 800 | LF | 80 | 64,000 | | 48" ϕ CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Subbase & Base | 10,000 | CY | 21 | 210,000 | | |
| | Guardrail | 9,000 | LF | 32 | 288,000 | | |
| | Snowshed & Slide Fall | 1,000 | LF | 800 | 800,000 | | |
| | Round-Off | | | | (19,000) | | |
| | | | | | | 3,900,000 | |
| | Temporary Construction Roads | | | | | | |
| | Earthwork | 61,000 | CY | 6 | 366,000 | | |
| | Culverts | 600 | LF | 80 | 48,000 | | |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Guardrail | 2,000 | LF | 25 | 50,000 | | |
| | Round-Off | | | | (14,000) | | |
| | | | | | | 900,000 | |
| | Road Maintenance | | | | | | |
| | Summer Season | 36 | MO | 120,000 | 4,320,000 | | |
| | Winter Season | 24 | MO | 480,000 | 11,520,000 | | |
| | Round-Off | | | | (40,000) | | |
| | | | | | | 15,800,000 | |
| | TOTAL ACCESS & CONSTRUCTION ROADS | | | | | 44,100,000 | |

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**ALTERNATIVE D
ESTIMATED COST**



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|----------------------------|
| | POWER PLANT STRUCTURE & IMPROVEMENTS | | | | | | |
| | Valve Chamber | | | | | | |
| | Excavation & Supports | 10,500 | CY | 270 | 2,835,000 | | |
| | Concrete & Reinf Steel | 6,520 | CY | 410 | 2,673,200 | | |
| | Struc. Steel & Misc. Metals | 52 | TON | 1,800 | 93,600 | | |
| | Round-Off | | | | (1,800) | | |
| | | | | | | 5,600,000 | |
| | Underground Powerhouse | | | | | | |
| | Dewatering | | LS | | 4,100,000 | | Entire Underground Complex |
| | Excavation & Supports | 64,000 | CY | 155 | 9,920,000 | | |
| | Drilling-Percus.& Rotary | 15,000 | LF | 30 | 450,000 | | 2" - 3"ø |
| | Concrete & Reinf. Steel | 14,200 | CY | 630 | 8,946,000 | | |
| | Struc. Steel & Misc Metals | 330 | TON | 5,300 | 1,749,000 | | |
| | Architectural | | LS | | 1,000,000 | | |
| | Round-Off | | | | 35,000 | | |
| | | | | | | 26,200,000 | |
| | Bus Galleries Between Powerhouse & Transformer Vaults | | | | | | |
| | Excavation & Supports | 200 | CY | 825 | 165,000 | | |
| | Concrete | 120 | CY | 290 | 34,800 | | |
| | Round Off | | | | 200 | | |
| | | | | | | 200,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---|----------|------|------------|-----------|------------|---------|
| | Transformer Gallery & Tunnels | | | | | | |
| | Excavation & Supports | 11,960 | CY | 290 | 3,468,400 | | |
| | Concrete & Reinf Steel | 830 | CY | 460 | 381,800 | | |
| | Struc Steel & Misc. Metals | 120 | TON | 3,800 | 456,000 | | |
| | Round Off | | | | (6,200) | | |
| | | | | | | 4,300,000 | |
| | Valve Chamber & Transformer Gallery-Access Tunnels | | | | | | |
| | Excavation & Supports | 1,500 | CY | 250 | 375,000 | | |
| | Concrete | 60 | CY | 290 | 17,400 | | |
| | Round-Off | | | | 7,600 | | |
| | | | | | | 400,000 | |
| | Powerhouse Access Tunnel | | | | | | |
| | Portal Excav. & Protection | 56,000 | CY | 10 | 560,000 | | |
| | Portal Conc. & Reinf. Steel | 1,000 | CY | 570 | 570,000 | | |
| | Tunnel Excav. & Supports | 24,000 | CY | 300 | 7,200,000 | | |
| | Tunnel Concrete | 900 | CY | 290 | 261,000 | | |
| | Tunnel Misc. Metals | 30 | TON | 11,000 | 330,000 | | |
| | Subsurface Exploration | | | | | | |
| | Mobilization | | LS | | 1,500,000 | | |
| | Exploratory Adit | 1,000 | LF | 1,800 | 1,800,000 | | |
| | Core drilling | 5,000 | LF | 140 | 700,000 | | |
| | Helicopter Service | | LS | | 600,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 13,500,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-----------|------------|---------|
| | <u>RESERVOIR, DAM & WATERWAYS</u> | | | | | | |
| | <u>Reservoir</u> | | | | | | |
| | Water Level Recording | | LS | | | 100,000 | |
| | <u>Intake Structure</u> | | | | | | |
| | Site Exploration | | | | | | |
| | Mobilization | | LS | | 150,000 | | |
| | Core Drilling | 5,000 | LF | 80 | 400,000 | | |
| | Helicopter Service | | LS | | 150,000 | | |
| | Tunnel Excav. & Supports | 12,000 | CY | 470 | 5,640,000 | | |
| | Tunnel Conc. & Reinf. Steel | 100 | CY | 350 | 35,000 | | |
| | Lake-Tap (Final Round) | | LS | | 3,000,000 | | L = 26' |
| | Place & Remove Temp. Conc. | 600 | CY | 700 | 420,000 | | |
| | Diving Crew | 60 | DAYS | 10,000 | 600,000 | | |
| | Round-Off | | | | 5,000 | | |
| | | | | | | 10,400,000 | |
| | <u>Intake Gate Shaft</u> | | | | | | |
| | Shaft Excav. & Supports | 10,000 | CY | 360 | 3,600,000 | | |
| | Mass Surface Excav. | 50,000 | CY | 30 | 1,500,000 | | |
| | Concrete & Reinf. Steel | 5,700 | CY | 890 | 5,073,000 | | |
| | Misc. Metals, Gates & Hoist | 244 | TON | 12,500 | 3,050,000 | | |
| | Round-Off | | | | (23,000) | | |
| | | | | | | 13,200,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|---------------------------------------|----------|------|------------|-------------|-------------|---------|
| | <u>Access Tunnel at Mile 3.5 No.1</u> | | | | | | |
| | Portal Excav & Protection | 6,000 | CY | 53 | 318,000 | | |
| | Tunnel Excav & Supports | 68,000 | CY | 297 | 20,196,000 | | |
| | Tunnel Conc & Reinf Steel | 500 | CY | 430 | 215,000 | | |
| | Grouting-Contact & Pressure Round-Off | 1,125 | CF | 58 | 65,250 | | |
| | | | | | 5,750 | 20,800,000 | |
| | <u>Access Tunnel at Mile 7.5 No.2</u> | | | | | | |
| | Portal Excav & Protection | 6,000 | CY | 54 | 324,000 | | |
| | Tunnel Excav & Supports | 45,000 | CY | 298 | 13,410,000 | | |
| | Tunnel Conc & Reinf Steel | 1,600 | CY | 420 | 672,000 | | |
| | Grouting-Contact & Pressure Round-Off | 2,300 | CF | 58 | 133,400 | | |
| | | | | | (39,400) | 14,500,000 | |
| | <u>Power Tunnel</u> | | | | | | |
| | Excavation & Supports | 67,000 | LF | 7,698 | 515,766,000 | | |
| | Concrete | 514,000 | CY | 334 | 171,676,000 | | |
| | Grouting-Contact & Pressure Round-Off | 464,000 | CF | 54 | 25,056,000 | | |
| | | | | | 2,000 | 712,500,000 | |



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|-----|---|----------|------|------------|-----------|-------------|---------|
| | <u>Tailrace Tunnel & Structures</u> | | | | | | |
| | Cofferdam & Dewatering | | LS | | 2,000,000 | | |
| | Portal Excav. & Protection | 2,000 | CY | 65 | 130,000 | | |
| | Concrete & Reinf. Steel | 1,200 | CY | 600 | 720,000 | | |
| | Walkway Bridge | | LS | | 65,000 | | |
| | Stoplogs & Hoists | 81 | TON | 8,500 | 688,500 | | |
| | Tunnel Excav. & Supports | 25,000 | CY | 260 | 6,500,000 | | |
| | Plug Excavation | 4,000 | CY | 50 | 200,000 | | |
| | Round-Off | | | | (3,500) | | |
| | | | | | | 10,300,000 | |
| | <u>Tailrace Channel</u> | | | | | | |
| | Channel Excavation | 100,000 | CY | 9 | | 900,000 | |
| | <u>River Training Works</u> | | | | | | |
| | River Bed Deepening | 50,000 | CY | 10 | | 500,000 | |
| | <u>Mech & Elec.</u> | | LS | | | 5,700,000 | |
| | <u>TOTAL RESERVOIR, DAM AND WATERWAYS</u> | | | | | 871,600,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|-----------|------|------------|-----------|------------|----------|
| | <u>Access & Construction Roads</u> | | | | | | |
| | Mile 0+00 to 18+00 | | | | | | |
| | Earthwork | 175,000 | CY | 6.60 | 1,155,000 | | |
| | Culverts | 1,500 | LF | 65 | 97,500 | | |
| | Bridges | 1,400 | SF | 150 | 210,000 | | |
| | Subbase & Base | 85,400 | CY | 15 | 1,281,000 | | |
| | Guard Rail | 1,200 | LF | 25 | 30,000 | | |
| | Repair Existing Road | 95,000 | LF | 10 | 950,000 | | |
| | Snow Fences | 5,000 | LF | 35 | 175,000 | | |
| | Round-Off | | | | 1,500 | 3,900,000 | |
| | Mile 18+00 to 35+00 | | | | | | |
| | Earthworks | 1,465,000 | CY | 6.60 | 9,669,000 | | |
| | Culverts | 3,600 | LF | 80 | 288,000 | | 48"Ø CMP |
| | Subbase & Base | 165,000 | CY | 15 | 2,475,000 | | |
| | Guard Rail | 13,000 | LF | 25 | 325,000 | | |
| | Repair Existing Road | 16,000 | LF | 10 | 160,000 | | |
| | Snow Fences | 1,000 | LF | 35 | 35,000 | | |
| | Round-Off | | | | 48,000 | 13,000,000 | |
| | Mile 35+00 to 39+00 | | | | | | |
| | Earthwork | 445,000 | CY | 8.30 | 3,693,500 | | |
| | Culverts | 1,000 | LF | 80 | 80,000 | | 48"Ø CMP |
| | Bridge | 9,000 | SF | 150 | 1,350,000 | | |
| | Subbase & Base | 38,000 | CY | 15 | 570,000 | | |
| | Guard Rail | 10,000 | LF | 27 | 270,000 | | |
| | Snow Fences | 2,000 | LF | 35 | 70,000 | | |
| | Round-Off | | | | (33,500) | 6,000,000 | |



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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|----------------|
| | Access Road to Downstream Power Tunnel | | | | | | |
| | Earthwork | 215,000 | CY | 9.80 | 2,107,000 | | |
| | Culverts | 800 | LF | 80 | 64,000 | | 48" ϕ CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Subbase & Base | 10,000 | CY | 21 | 210,000 | | |
| | Guardrail | 9,000 | LF | 32 | 288,000 | | |
| | Snowshed & Slide Fall | 1,000 | LF | 800 | 800,000 | | |
| | Round-Off | | | | (19,000) | | |
| | | | | | | 3,900,000 | |
| | Temporary Construction Roads | | | | | | |
| | Earthwork | 61,000 | CY | 6 | 366,000 | | |
| | Culverts | 600 | LF | 80 | 48,000 | | |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Guardrail | 2,000 | LF | 25 | 50,000 | | |
| | Round-Off | | | | (14,000) | | |
| | | | | | | 900,000 | |
| | Road Maintenance | | | | | | |
| | Summer Season | 36 | MO | 120,000 | 4,320,000 | | |
| | Winter Season | 24 | MO | 480,000 | 11,520,000 | | |
| | Round-Off | | | | (40,000) | | |
| | | | | | | 15,800,000 | |
| | TOTAL ACCESS & CONSTRUCTION ROADS | | | | | 44,100,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|-----------|------------|----------------------------|
| | <u>POWER PLANT STRUCTURE & IMPROVEMENTS</u> | | | | | | |
| | <u>Valve Chamber</u> | | | | | | |
| | Excavation & Supports | 10,000 | CY | 275 | 2,750,000 | | |
| | Concrete & Reinf Steel | 6,520 | CY | 410 | 2,673,200 | | |
| | Struc. Steel & Misc. Metals | 52 | TON | 1,800 | 93,600 | | |
| | Round-Off | | | | (16,800) | | |
| | | | | | | 5,500,000 | |
| | <u>Underground Powerhouse</u> | | | | | | |
| | Dewatering | | LS | | 4,100,000 | | Entire Underground Complex |
| | Excavation & Supports | 58,900 | CY | 168 | 9,895,200 | | |
| | Drilling-Percus. & Rotary | 12,700 | LF | 27 | 342,900 | | 2" - 3" ϕ |
| | Concrete & Reinf. Steel | 13,100 | CY | 630 | 8,253,000 | | |
| | Struc. Steel & Misc Metals | 300 | TON | 5,300 | 1,590,000 | | |
| | Architectural | | LS | | 1,000,000 | | |
| | Round-Off | | | | 18,900 | | |
| | | | | | | 25,200,000 | |
| | <u>Bus Galleries Between Powerhouse & Transformer Vaults</u> | | | | | | |
| | Excavation & Supports | 200 | CY | 825 | 165,000 | | |
| | Concrete | 120 | CY | 290 | 34,800 | | |
| | Round Off | | | | 200 | | |
| | | | | | | 200,000 | |

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|-----|---|----------|------|------------|-----------|------------|---------|
| | <u>Transformer Gallery & Tunnels</u> | | | | | | |
| | Excavation & Supports | 11,960 | CY | 290 | 3,468,400 | | |
| | Concrete & Reinf Steel | 830 | CY | 460 | 381,800 | | |
| | Struc Steel & Misc. Metals | 120 | TON | 3,800 | 456,000 | | |
| | Round Off | | | | (6,200) | | |
| | | | | | | 4,300,000 | |
| | <u>Valve Chamber & Transformer Gallery-Access Tunnels</u> | | | | | | |
| | Excavation & Supports | 1,500 | CY | 250 | 375,000 | | |
| | Concrete | 60 | CY | 290 | 17,400 | | |
| | Round-Off | | | | 7,600 | | |
| | | | | | | 400,000 | |
| | <u>Powerhouse Access Tunnel</u> | | | | | | |
| | Portal Excav. & Protection | 56,000 | CY | 10 | 560,000 | | |
| | Portal Conc. & Reinf. Steel | 1,000 | CY | 570 | 570,000 | | |
| | Tunnel Excav. & Supports | 24,000 | CY | 300 | 7,200,000 | | |
| | Tunnel Concrete | 900 | CY | 290 | 261,000 | | |
| | Tunnel Misc. Metals | 30 | TON | 11,000 | 330,000 | | |
| | Subsurface Exploration | | | | | | |
| | Mobilization | | LS | | 1,500,000 | | |
| | Exploratory Adit | 1,000 | LF | 1,800 | 1,800,000 | | |
| | Core drilling | 5,000 | LF | 140 | 700,000 | | |
| | Helicopter Service | | LS | | 600,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 13,500,000 | |

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|----------------------------------|----------|------|------------|------------|------------|---------|
| | Upstream Fish Passage Facility | | | | | | |
| | Excavation & Support | 16,550 | CY | 163 | 2,697,650 | | |
| | Concrete & Reinf. Steel | 5,880 | CY | 759 | 4,462,920 | | |
| | Misc. Metal, Gates & Crane | | LS | | 1,786,300 | | |
| | Electrical & Instrumentation | | LS | | 200,000 | | |
| | Round Off | | | | (3,130) | | |
| | | | | | | 9,150,000 | |
| | Downstream Fish Passage Facility | | | | | | |
| | Excavation & Support | 8,900 | CY | 191 | 1,699,900 | | |
| | Concrete & Reinf. Steel | 2,600 | CY | 635 | 1,651,000 | | |
| | Misc. Metal, Gates & Crane | | LS | | 2,283,000 | | |
| | Electrical & Instrumentation | | LS | | 100,000 | | |
| | Round Off | | | | (3,900) | | |
| | | | | | | 5,730,000 | |
| | Access Tunnel | | | | | | |
| | Excavation & Support | 122,500 | CY | 303 | 37,117,500 | | |
| | Concrete & Reinf. Steel | 22,800 | CY | 573 | 13,064,400 | | |
| | Misc. Metal | | LS | | 405,000 | | |
| | Electrical - Lighting | | LS | | 231,000 | | |
| | Round Off | | | | (7,900) | | |
| | | | | | | 50,810,000 | |

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|-----|--------------------------------|----------|------|------------|-----------|------------|---------|
| | <u>Fish Passage Facilities</u> | | | | | | |
| | Excavation & Support | 6,600 | CY | 53 | 349,800 | | |
| | Concrete & Reinf. Steel | 740 | CY | 778 | 575,720 | | |
| | Misc. Metal, Gate, etc. | | LS | | 434,650 | | |
| | Round Off | | | | (170) | | |
| | | | | | | 1,360,000 | |
| | <u>Chakachatna River</u> | | | | | | |
| | <u>Flow Regulation</u> | | | | | | |
| | River Bed Deepening | 10,000 | CY | 9.50 | 95,000 | | |
| | Rip-Rap | 1,000 | CY | 35.00 | 35,000 | | |
| | | | | | | 130,000 | |
| | <u>Access Road</u> | | LS | | | 300,000 | |
| | <u>Access Tunnel to Fish</u> | | | | | | |
| | <u>Passage Facilities</u> | | | | | | |
| | Portals Excavation | 700 | CY | 93 | 65,100 | | |
| | Tunnel Excavation & Support | 3,350 | CY | 314 | 1,051,900 | | |
| | Round Off | | | | 3,000 | | |
| | | | | | | 1,120,000 | |
| | <u>Total Fish Facilities</u> | | | | | 85,400,000 | |

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|-----|--|----------|------|------------|-----------|------------|---------|
| | <u>Penstock-Wye Branches to Valve Chamber</u> | | | | | | |
| | Excavation & Supports | 9,000 | CY | 480 | 4,320,000 | | |
| | Concrete & Reinf. Steel | 6,100 | CY | 608 | 3,708,800 | | |
| | Steel Liner | 700 | TON | 5,000 | 3,500,000 | | |
| | Grouting-Contact | 7,000 | CY | 56 | 392,000 | | |
| | Round-Off | | | | (20,800) | | |
| | | | | | | 11,900,000 | |
| | <u>Penstock Between Valve Chamber & Powerhouse</u> | | | | | | |
| | Excavation & Supports | 850 | CY | 440 | 374,000 | | |
| | Concrete & Backfill | 500 | CY | 550 | 275,000 | | |
| | Round-Off | | | | (49,000) | | |
| | | | | | | 600,000 | |
| | <u>Draft Tube Tunnels</u> | | | | | | |
| | Rock Bolts & Grout | 15,000 | LF | 29 | 435,000 | | |
| | Concrete & Reinf. Steel | 2,975 | CY | 425 | 1,264,375 | | |
| | Round-Off | | | | 625 | | |
| | | | | | | 1,700,000 | |
| | <u>Surge Chamber - Tailrace</u> | | | | | | |
| | Excavation & Supports | 5,000 | CY | 480 | | 2,400,000 | |
| | | | | | | | |
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|-----|---|----------|------|------------|-----------|-------------|---------|
| | <u>Tailrace Tunnel & Structures</u> | | | | | | |
| | Cofferdam & Dewatering | | LS | | 2,000,000 | | |
| | Portal Excav. & Protection | 2,000 | CY | 65 | 130,000 | | |
| | Concrete & Reinf. Steel | 1,200 | CY | 600 | 720,000 | | |
| | Walkway Bridge | | LS | | 65,000 | | |
| | Stoplogs & Hoists | 81 | TON | 8,500 | 688,500 | | |
| | Tunnel Excav. & Supports | 20,000 | CY | 290 | 5,800,000 | | |
| | Plug Excavation | 4,000 | CY | 50 | 200,000 | | |
| | Round-Off | | | | (3,500) | | |
| | | | | | | 9,600,000 | |
| | <u>Tailrace Channel</u> | | | | | | |
| | Channel Excavation | 80,000 | CY | 9 | 720,000 | | |
| | | | | | (20,000) | | |
| | | | | | | 700,000 | |
| | <u>River Training Works</u> | | | | | | |
| | River Bed Deepening | 50,000 | CY | 10 | | 500,000 | |
| | | | | | | | |
| | Mech & Elec. | | LS | | | 6,100,000 | |
| | <u>TOTAL RESERVOIR, DAM AND WATERWAYS</u> | | | | | 633,600,000 | |

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|-----|--|-----------|------|------------|-----------|------------|----------|
| | <u>Access & Construction Roads</u> | | | | | | |
| | Mile 0+00 to 18+00 | | | | | | |
| | Earthwork | 175,000 | CY | 6.60 | 1,155,000 | | |
| | Culverts | 1,500 | LF | 65 | 97,500 | | 36"Ø CMP |
| | Bridges | 1,400 | SF | 150 | 210,000 | | |
| | Subbase & Base | 85,400 | CY | 15 | 1,281,000 | | |
| | Guard Rail | 1,200 | LF | 25 | 30,000 | | |
| | Repair Existing Road | 95,000 | LF | 10 | 950,000 | | |
| | Snow Fences | 5,000 | LF | 35 | 175,000 | | |
| | Round-Off | | | | 1,500 | | |
| | | | | | | 3,900,000 | |
| | Mile 18+00 to 35+00 | | | | | | |
| | Earthworks | 1,465,000 | CY | 6.60 | 9,669,000 | | |
| | Culverts | 3,600 | LF | 80 | 288,000 | | 48"Ø CMP |
| | Subbase & Base | 165,000 | CY | 15 | 2,475,000 | | |
| | Guard Rail | 13,000 | LF | 25 | 325,000 | | |
| | Repair Existing Road | 16,000 | LF | 10 | 160,000 | | |
| | Snow Fences | 1,000 | LF | 35 | 35,000 | | |
| | Round-Off | | | | 48,000 | | |
| | | | | | | 13,000,000 | |
| | Mile 35+00 to 39+00 | | | | | | |
| | Earthwork | 445,000 | CY | 8.30 | 3,693,500 | | |
| | Culverts | 1,000 | LF | 80 | 80,000 | | 48"Ø CMP |
| | Bridge | 9,000 | SF | 150 | 1,350,000 | | |
| | Subbase & Base | 38,000 | CY | 15 | 570,000 | | |
| | Guard Rail | 10,000 | LF | 27 | 270,000 | | |
| | Snow Fences | 2,000 | LF | 35 | 70,000 | | |
| | Round-Off | | | | (33,500) | | |
| | | | | | | 6,000,000 | |



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|-----|---------------------------------|----------|------|------------|-----------|-----------|-------------------|
| | Walkway To Gate Shaft | | | | | | |
| | Earthwork | 1,200 | CY | 20 | 24,000 | | |
| | Guard Rail | 1,000 | LF | 25 | 25,000 | | |
| | Bridge | 200 | SF | 150 | 30,000 | | |
| | Riprap | 100 | CY | 35 | 3,500 | | |
| | Round-Off | | | | 17,500 | | |
| | | | | | | 100,000 | |
| | Access Road to MacArthur Valley | | | | | | |
| | Earthwork | 545,000 | CY | 7 | 3,815,000 | | |
| | Culverts | 2,400 | LF | 75 | 180,000 | | 36"Ø and 48"Ø CMP |
| | Bridge Improvements | 9,000 | SF | 70 | 630,000 | | |
| | Subbase & Base | 105,000 | CY | 15 | 1,575,000 | | |
| | Guard Rail | 6,000 | LF | 25 | 150,000 | | |
| | Snow Fences | 3,000 | LF | 35 | 105,000 | | |
| | Round-Off | | | | 45,000 | | |
| | | | | | | 6,500,000 | |
| | Access Road to Tailrace Tunnel | | | | | | |
| | Earthwork | 56,000 | CY | 8 | 448,000 | | |
| | Culverts | 100 | LF | 80 | 8,000 | | 48"Ø CMP |
| | Subbase & Base | 2,500 | CY | 20 | 50,000 | | |
| | Guard Rail | 600 | LF | 25 | 15,000 | | |
| | Round-Off | | | | (21,000) | | |
| | | | | | | 500,000 | |



ESTIMATE SUMMARY

HAJ/APD
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CONCEPTUAL
TYPE OF ESTIMATE

14879-001

JOB NO.

NOV. 1982

DATE

SHEET 19 OF 20

CHAKACHAMNA HYDROELECTRIC PROJECT
PROJECT

ALASKA POWER AUTHORITY

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| NO. | DESCRIPTION | QUANTITY | UNIT | UNIT COSTS | AMOUNT | TOTALS | REMARKS |
|-----|--|----------|------|------------|------------|------------|----------|
| | Access Road to Downstream Power Tunnel | | | | | | |
| | Earthwork | 215,000 | CY | 9.80 | 2,107,000 | | |
| | Culverts | 800 | LF | 80 | 64,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Subbase & Base | 10,000 | CY | 21 | 210,000 | | |
| | Guardrail | 9,000 | LF | 32 | 288,000 | | |
| | Snowshed & Slide Fall | 1,000 | LF | 800 | 800,000 | | |
| | Round-Off | | | | (19,000) | | |
| | | | | | | 3,900,000 | |
| | Temporary Construction Roads | | | | | | |
| | Earthwork | 61,000 | CY | 6 | 366,000 | | |
| | Culverts | 600 | LF | 80 | 48,000 | | 48"Ø CMP |
| | Bridge | 3,000 | SF | 150 | 450,000 | | |
| | Guardrail | 2,000 | LF | 25 | 50,000 | | |
| | Round-Off | | | | (14,000) | | |
| | | | | | | 900,000 | |
| | Road Maintenance | | | | | | |
| | Summer Season | 45 | MO | 150,000 | 6,750,000 | | |
| | Winter Season | 30 | MO | 600,000 | 18,000,000 | | |
| | Round-Off | | | | 50,000 | | |
| | | | | | | 24,800,000 | |
| | TOTAL ACCESS & CONSTRUCTION ROADS | | | | | 59,600,000 | |



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