

ENERGY SURVEYS OF
ARMY CENTRAL HEATING
AND POWER PLANTS

ENERGY ENGINEERING
ANALYSIS PROGRAM (EEAP)

Volume 1 Executive Summary

FORT RICHARDSON

FORT WAINWRIGHT

FORT GREELY

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SUBMITTED TO

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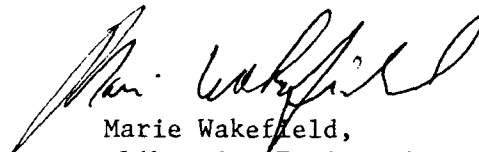


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PREFACE

This is a report of the Energy Surveys of Army Central Heating and Power Plant provided under the Energy Engineering Analysis Program (EEAP) for Fort Richardson, Fort Greely and Fort Wainwright, Alaska. This study consists of four volumes for each installation. The four volumes are completely separate reports. Volume 1, Executive Summary, briefs the report summarizing the conclusions and recommendations. Volume 2, Report, includes the executive summary and contains a description of the plants and processes. It also has a narrative discussion and evaluation of the ECOs studied at each power plant with a summary of the economics and recommendations. At the end of this volume is an outline for the operations and maintenance briefing to be provided for each installation. Volume 3, Documentation, contains the funding request documentation forms for the energy conservation opportunities (ECOs) that qualified, and other ECOs that were considered necessary for the continued operation of the central heating and power plants. Volume 4, Appendix, contains the detailed calculations, reference material and other data supporting the report and documentation.

Depending on the project cost and economics, for each viable ECO, documentation for one of the following fund programs were used:

Energy Conservation Investment Program (ECIP),
1391

Productivity Capital Investment Programs (PECIP
and QRIP)

EXECUTIVE SUMMARY

FORT RICHARDSON

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EXECUTIVE SUMMARY

FORT RICHARDSON

SECTION 1

INTRODUCTION

1.1 Authorization

This is the executive summary of the energy survey and project documentation that resulted from the Energy Survey of the Central Heating and Power Plant (CHPP) at Fort Richardson. It is a part of the continuing effort under the Energy Engineering Analysis Program (EEAP). Similar energy surveys and reports have been developed for Fort Greely and Fort Wainwright Central Heating and Power Plants concurrently. The Scope of Work of this program was developed by the Huntsville Division Corps of Engineers for use at all army central heating and power plants. Representatives from the Huntsville Division of the Corps, U.S. Army Forces Command (FORSCOM) and John Graham Company, Architect-Engineer visited the Fort Richardson CHPP during the summer of 1984. At that time, a generic Scope of Work was reviewed. From it, a detailed scope was developed for Fort Richardson. A complete Scope of Work can be found in Appendix J Volume 4 of this report.

1.2 Purpose of Study

The purpose of this study is to review and study all potential energy conservation opportunities (ECOs) at the Fort Richardson Central Heating and Power Plant (CHPP). These ECOs would then be developed to determine the economies and feasibility of implementation. The equipment at this plant is over 30 years old. The CHPP is meeting the requirements of providing electrical power generation steam for heating the base. It is a functional operating plant that will, with proper maintenance and repairs, continue to perform for many more years. With a CHPP of this age there was reason to believe that many energy conservation opportunities do exist. Section 4 describes the ECOs found and studied.

The study required that the condition and efficiency of the boilers and auxiliaries of the entire plant be evaluated. This was necessary to establish that the plant had the ability to operate efficiently for an expected life that justified the implementation of the recommended improvements. An evaluation was made to compare the existing plant recommended improvements against the cost and economics of a new replacement plant. The study evaluated and found the best method of providing efficient and reliable central heat and power for the future at Fort Richardson.

Previous studies by Black and Veatch, Consulting Engineers in 1978, Grumman Aerospace Corporation in 1982, were reviewed. Items that they recommended but had not been implemented were included as ECOs for study in this report.

1.3 Documentation

At meetings with DEH the studied ECOs were selected for grouping into projects for funding documentation to accomplish the energy savings. Volume 2 Report evaluates each energy conservation opportunity (ECO) found at the Central Heating and Power Plant. The evaluation of the ECOs is discussed in Section 4 of this summary. The ECOs were then reviewed and developed into groups for funding requests. The funding requests are discussed in Section 5 of this summary. Volume 3 "Documentation" contains the actual funding requests, which includes Energy Conservation Investment Program (ECIP on Form 1391) and Productivity Capital Investment Program (QRIP on DA Form 5108). The contents included request forms for one Energy Conservation Investment Program (ECIP), two Military Construction Project Data (DD Form 1391), two Productivity Enhancement Capital Investment Programs (PECIP) and one Quick Return on Investment Program (QRIP) for funding.

1.4 Energy Survey Contract

The Energy Survey contract was awarded to John Graham Company, Engineers and Architects, of Seattle and Anchorage. Charles Schmidt, Inc., Consulting Engineers of Cleveland, Ohio worked as sub-consultants to them. Bailey Controls

Company was used to calibrate instruments prior to boiler testing.

SECTION 2

BOILER PLANT DESCRIPTION

2.1 General

The Fort Richardson Central Heating and Power Plant (CHPP) located in Building 36012 was built in 1953; contains eight Erie City Iron Works boilers. Four of these boilers have been converted to gas fuel and are used for normal steam production. The four remaining coal-fired boilers are not part of the energy study. The five turbine generators have a capacity of 18 MW and are operated to provide part of the basic electrical requirements. Turbine number one is condensing using water from the domestic water mains for condenser water. Turbines numbers 2 and 3 are operated using well water in the condensers with the warm water going to a State of Alaska fish hatchery adjacent to the CHPP. Turbine numbers 4 and 5 are back pressure units that are used as required to provide 90 psig heating steam for distribution to the base and the Elmendorf AFB Hospital.

The plant in the period of February 1984 to January 1985 used 1,829,110,000 cubic feet of gas to produce 1,433,892,000 pounds of steam at a cost of \$3,086,989. In addition they burned 5,563 tons of coal and 7,468 gallons of oil during periods of gas interruption and testing of equipment on these fuels. Coal and oil is not used every year. This coal and oil came from reserve storage and the price could not be determined.

2.2 Boilers

The boilers are Erie City Iron Works two drum type water tube boilers rated at 135,000 PPH of steam flow each at 415 psig steam at 750 degrees F total temperature. The boiler has water cooled, tube and tile walls and ceiling. The drums' tubes and pressure parts are in good condition. The casing has leaks and is in need of repairs.

2.3

The boilers were originally equipped with spreader stokers, and traveling grates. In 1968 boilers Nos. 5, 6, 7, and 8 were converted

to dual fuel, natural gas and oil with Faber burners. These are the boilers covered in this study.

2.4 Controls

The existing Bailey Meter Company Analog Combustion Control Systems was excellent when it was installed in 1954. It was the latest state-of-the-art at the time of installation. When in repair and adjustment it is performing to provide good combustion with these boilers. In 1968 Bailey Controls Inc. stopped manufacture of these controls and made available improved control systems. Parts for these controls are no longer available. Maintenance and repairs have become difficult. Control accuracy will slip as old parts are not replaced.

New controls are recommended. ECO 7.6.14 of this study finds that the cost of new controls will payback in fuel savings in 16 years with an SIR of 1.18.

2.5 Combustion Air

Combustion air for each boiler is drawn in high on the walls of the building. It is then heated and mixed with building air before going to a 75 HP forced draft fan. It then goes through an air preheater and is supplied hot to the burner front.

2.6 Induced Draft Fan

The 250 HP induced draft fan on each boiler draws combustion gases up through the air preheater and mechanical collector. It then exhausts through the roof with a separate stack for each boiler.

2.7 Cooling Pond

The CHPP has a cooling pond that is not used. Two of the condensing turbines are supplied with well water to the condensers and then as effluent to an adjacent fish hatchery. The flow rate is adjusted to provide a constant temperature of water. One turbine condensor uses water from the domestic water mains in the street.

SECTION 3

FIELD AUDIT WORK

3.1 General

A field audit team of three engineers spent over five days surveying conditions at the Fort Richardson Central Heating and Power Plant (CHPP). At times all these engineers plus plant personnel were required to perform boiler tests. At times each engineer pursued different phases of the field audit. Time was required to review original construction plans, specifications, and equipment data in operating manuals.

3.2 Boiler Performance

Boiler performance tests were conducted on the four gas-fired boilers. Each test took one day. The tests were run at loads of approximately 48,000 PPH, 80,000 PPH, and 110,000 PPH. The boilers were stabilized at these loads. Then tests were run at 10 minutes intervals until proper data was received.

Data was collected for both the ASME Power Test Code INPUT-OUTPUT METHOD as required by the Scope of Work and for the HEAT-LOSS METHOD. In addition data was collected for analysis on the Schmidt Fuel Curve. This collection of data permitted cross checking data.

Data collection included fuel flow, steam flow, flue gas pressures at several points, combustion air temperatures at several points and flue gas analysis. Flue gas analysis was made by a Teledyne Analytical Instrument, Model 980 and temperatures were measured with an iron constantan thermocouple.

3.3 Fuel

The only fuel normally used in these boilers is natural gas with a heating value of 1000 BTU per cubic foot. The gas is supplied by the local utility, Enstar Natural Gas Company.

3.4 Boiler Efficiency Test

The efficiencies of the boilers varied from 80% to 91% depending on the load and method of testing. The report covers the efficiency testing in detail and the test data sheets are contained in Volume 4 Appendix C, D, E, and F.

3.5 Boiler Condition

The boiler was inspected for air leakage. One boiler was taken out of service for internal inspection for corrosion and distribution piping condition. Tubes were checked for alignment and blisters. Refractory tile was checked for condition. Drums were entered and the internals inspected. One boiler was filled with smoke and then pressurized to locate casing leaks.

3.6 Piping System

Piping systems were observed for conditions and restrictions. The pipe insulation was in good condition. The pipes and valves were in good condition. The piping was found to be of adequate size and free of restrictions.

3.7 Pumping Systems

Pumping systems were observed for proper operation. Pump curves were studied. Pumps were studied for the application of variable speed drives or other improvements. Pumps were found to be operating properly.

3.8 Fish Hatchery

The fish hatchery was visited to verify the water requirements. The methods of controlling water flow and temperature were studied. It was determined that the present hand control method of operation is adequate. Automation would not result in energy savings.

SECTION 4

ENERGY CONSERVATION OPPORTUNITIES

4.1 General

The primary purpose of this energy engineering analysis was to study specific energy conservation opportunities in order to recommend power plant improvements and project developments. The Scope of Work lists specific ECOs to be investigated and others were developed as a result of the field audit. These ECOs were all investigated and studied. Some were found to be maintenance and operation items and others were combined with related ECOs. The ECO list included items proposed by Black and Veatch, Consulting Engineers, in their 1978 study, but not implemented to date.

Energy savings were developed using best available data. Plant data and meter readings were used when available. The boiler test data became part of the energy use calculation. Costs were developed from "Means Cost Data Book" and other sources. Labor costs were escalated for Fort Richardson using a 1.42 area cost factor index.

The specific ECOs studied are reviewed in this section. They are also listed on summary sheets in Section 6.

4.2 Air Fuel Ratio Control (ECO 7.6.1)

The present controls do measure air and fuel to attempt proper mixtures. Newly developed oxygen analyzers are capable of measuring oxygen and carbon monoxide in the flue gas to provide accurate air fuel mixing. This type of analyzer can be installed on all four boilers for \$118,772 and will provide a savings in fuel of \$42,683/Year. This provides a payback of 2.8 years and an SIR of 6.86.

The 1982 Grumman Study also recommended this showing a construction cost of \$40,000 and a savings of \$30,000/Year for a payback of 1.3 and a discounted savings/investment ratio of 9.9.

This modification is recommended but it should not be considered without considering the need for total replacement of all controls discussed in Item 4.15 (ECO 7.6.14) of this section.

4.3 Feedwater Treatment (ECO 7.6.2)

The CHPP was all ready in the process of replacing the original feedwater treatment system at the time of the field audit. This new system will provide an adequate system for this plant. The ECO has been implemented.

4.4 Waste Heat Recovery (ECO 7.6.3)

This ECO required the study of several waste heat streams to see if any of these had a potential for energy savings. The boiler flue gas residual heat is recovered in the air preheater. Steam pressure flows were studied and found to not waste heat. All auxiliary systems seemed to be well designed.

The continuous blow down tank discharge is through a heat exchanger. This heat exchanger heats treated make up water that is pumped intermittently to the system. By changing the piping the water could become continuous. This change would almost double the effectiveness of this heat exchanger. This is covered in Item 4.11 of this section.

4.5 Operation and Maintenance Procedures (ECO 7.6.4)

This ECO studied O&M procedures that would save energy. While many items were studied and discussed, no ECO was developed from this study.

4.6 New Burner Equipment (ECO 7.6.5)

The present burners were installed in the boilers in 1968. At that time they were the "State-of-the-Art". They are still good burners. There is little or no energy saving likely to result from the installation of new burners.

4.7 Reduce Excess Air (Automatic Controller) (ECO 7.6.6)

Excess air in the gases represents air that did not help in the combustion process but exist to carry heat away. This problem can be corrected

in several ways. Item 4.15 discusses controls to reduce excesses. Item 4.12 discusses air leakage through the boiler casing. This ECO was not developed.

4.8 Loading Characteristics and Scheduling (ECO 7.6.7)

This ECO explores the loading and scheduling of equipment and auxiliaries to operate them to use the minimum amount of energy. The study showed that the equipment was being operated at the best efficient loads. This study did not find an ECO to develop into a project.

4.9 Variable Speed Circulating Pumps (ECO 7.6.8)

This ECO explored all pumps to find those that work against a throttling condition when speed control would reduce power consumption. The four 250 HP Boiler Feed Pumps showed great potential for energy savings with a variable speed drive. At a cost of \$262,000 all four boiler feedwater pumps could be converted to variable speed drive. This would result in an annual energy savings of \$3,000 of electrical power per year. This would result in a payback of 8.5 years and an SIR of 1.56. This project is recommended.

The 1982 Grumman Study did not find these controls as cost effective. They did not develop economic data.

4.10 Steam Distribution Pressure Reduction (ECO 7.6.9)

The heat loss in a large steam distribution system is proportional to the steam temperature or steam pressure. The CHPP has lowered the pressure to 95 psig. This is the lowest pressure that will provide adequate steam pressure to the Elmendorf AFB Hospital. By installing pressure reducing valves in the steam lines to Fort Richardson the pressure in that system could be lowered to 80 psig in winter and 70 psig in summer. This would cost \$108,090 and save \$252,963 per year. This provides a 0.45 year payback and an SIR of 43.

The Grumman study recommended dropping the pressure to 70 psig while ignoring the hospital requirements. The economic data is not comparable to this ECO.

4.11 Blowdown Control (ECO 7.6.10)

The CHPP continuous boiler blowdown system goes to a blowdown tank where 5 psig steam is recovered. The blowdown liquid is then wasted through a heat exchanger that heats treated make up water. The water flow at this point is intermittently operating about 54% of the time over the year. By repiping the system the water flow can be made to be continuous with a large increase in heat recovery. At a repiping cost of \$10,800 - savings of equal to 4,046,500 cubic feet of gas or \$6,831/year can be obtained. This results in a 1.6 year payback with an SIR of 12.24.

The Grumman Study recommended a similar modification. They estimated a construction cost of \$5,000 and an annual savings of \$21,200 for a discounted saving/investment ratio of 55.

4.12 Prevent Air Leakage (Rebuilt Boiler Settings) (ECO 7.6.11)

Excess air in the flue gases from air leakage represents air that did not help in the combustion process but exists to carry heat away. Excess air comes in through cracks in the tile refractory and metal panel skin that form the walls or casing of furnace and boiler. These boilers are over 30 years old and the casings have many leaks. Rebuilding of the casings at a cost of \$3,488,000 for the four boilers would increase boiler efficiency by 0.8%. This would result in a savings of 18,010,000 cubic feet of gas a year. The payback is 114.7 years with an SIR of 0.22. This ECO is not justified by energy savings. It is recommended as it will increase boiler life avoiding boiler or boiler plant replacement costs.

4.13 Steam Driven Auxiliaries (ECO 7.6.12)

This ECO studied the use of existing steam driven auxiliaries and the economics of additional steam driven auxiliaries.

With large efficient electric generating turbines providing extraction steam at 95 psig and back pressure exhaust at 5 psig, there is no need for auxiliary turbine exhaust. There is no need for additional auxiliary turbine

drives. The auxiliary turbine drives are only valuable when they contribute to the plant's heat balance.

4.14 Variable Speed Induced and Forced Draft Fans (ECO 7.6.13A & 7.6.13B)

This ECO studied the use of variable speed drives on the induced and forced draft fans. Variable speed drives are very efficient on fans of this type that are dampered for control during normal operation. The estimated cost for installation of the induced draft fan controllers on four boilers are estimated to cost \$305,220 and would provide a savings estimated to be 607,600 Kwh per year representing a cost savings of \$21,327 per year. This provides a 14.3 year payback and an SIR of 0.91.

The forced draft fan variable speed controllers are estimated to cost \$156,792 and would provide a savings estimated to be 184,000Kwh per year representing a cost savings of \$6,457. This provides a 24 year payback and an SIR of 0.44.

With this poor payback for both the fan system variable speed controllers cannot be recommended at this time. Should gas prices increase the ECO should be re-evaluated.

The Grumman Study used one set of controllers for two boilers - a practice we do not recommend. On this basis the cost was \$348,000 with a savings of \$50,500 per year. This provided a payback of 6.9 years and a discounted savings/investment ratio of 1.9. This method installation is not comparable to this study.

4.15 Automatic Boiler Combustion Controls (ECO 7.6.14)

This ECO studied the replacement of the existing Bailey Controls with a modern system. This new control system would incorporate air fuel ratio controls discussed in Item 4.2 this section. The total replacement of the controls is necessary to improve efficiency, because parts are no longer available and the old controls are becoming a safety hazard.

The new control system would increase boiler efficiency 1.68%. This would save 38,619,000 cubic feet of gas/year at a cost savings of \$65,189. This provides a 16.4 year payback with an SIR of 1.41. This project (ECO 7.6.14) is recommended.

4.16 Improve Desuperheaters (ECO 7.6.15)

This ECO first explored method of eliminating the need for desuperheaters because they use steam and are a maintenance problem. The desuperheaters are necessary to the present operation of the plant. The installation of a spray type desuperheater that would eliminate the steam used by the present old steam atomizing units was studied.

The installation of three spray type desuperheaters would cost \$36,680 but would save 565,715 KWH of electricity. This steam when used for generation represented \$19,800/year. This provides a 1.85 year payback and an SIR of 8.59.

The Grumman Study recommended the shut off of the desuperheaters for a savings of \$74,000 per year. This study found that superheated steam could damage the steam distribution system. The Black and Veatch study recommended a pressure atomizing desuperheater and one of the four original units was replaced.

4.17 Non-Condensing Steam Turbines (ECO 7.6.16)

This ECO studied the ability of lowering the exhaust or backpressure of the non-condensing turbines to improve efficiency. Since the turbine backpressure is determined by the steam distribution system pressure no independent lowering of pressure is possible. An ECO was not possible.

4.18 Previously Recommended Projects

This ECO reviewed projects recommended but not implemented in the 1978 Black & Veatch report and the 1982 Grumman study. All the recommended projects all matched or were similar to other ECOs studied. This earlier report data is covered where these ECOs are reported. This item did not result in an ECO.

SECTION 5
DOCUMENTATION

5.1 General

The purpose of this engineering analysis survey was not only to find ECOs and necessary maintenance items, but to provide the documents for funding. By providing the funding documents with this study the time required to request funds and implement the improvement projects is shortened.

At the interim review conference in October 1985, the potential list of ECOs and recommended improvements and repairs was reviewed for correction and evaluation with the DEH at each installation, the Alaska District Corps of Engineers representative, the U.S. Army Forces Command representative and others. At this meeting the ECOs were selected for grouping and type of funding.

5.2 Steam Distribution Pressure Reduction (ECO 7.6.9)

This QSD PIF, Item 9, Section 4, has a rapid payback of half a year. Installation is simple and energy savings come from a large steam distribution system.

5.3 Blowdown Control (ECO 7.6.10)

This QRIP, Item 10, Section 4, provides for an increase in blowdown heat recovery by simple changes in piping. Payback is less than 2 years.

5.4 Replacement Desuperheater (ECO 7.6.15)

This QRIP, Item 15, Section 4, eliminates the need for atomizing steam by using an improved type of desuperheater. Payback is less than 2 years.

5.5 Variable Speed Circulation Pumps (ECO 7.6.8)

The installation of variable speed controls on the feedwater pumps qualifies for an ECIP. This has an SIR of 1.56 and a payback period of 8.5 years.

5.6 Automatic Boiler Combustion Controls (ECO 7.6.14)

This major replacement of boiler combustion controls, Item 11, was selected for Form 1391 documentation. It has an SIR of 1.41 and a payback period of 16 years. It is considered necessary for continuing plant operation. At the request of the installation this ECO was documented for OMA funding.

5.7 Boiler Setting (ECO 7.6.11)

The boiler setting has leaks that are reducing efficiency and destroying wall insulation. The SIR is 0.17 and a payback period of 115 years. Because of the poor energy savings the installation requested that this ECO be documented with a Form 1391 for OMA funding.

SECTION 6

SUMMARY

6.1 General

There are three summary sheets. The first summary sheet lists ECOs that are recommended energy conservation opportunities. All ECOs on this list have savings investment ratios (SIR) above one and are recommended for implementation. They all meet the requirements of the Energy Engineering Analysis Program. The second summary sheet lists those ECOs that had an SIR of less than one and could not be recommended as energy projects. Some of these ECOs are still recommended as maintenance items that are necessary for plant operation. The third summary sheet lists the ECOs as they have been grouped and documented for funding.

END OF SECTION

TABLE 1

FORT RICHARDSON

SUMMARY OF RECOMMENDED

ENERGY CONSERVATION OPPORTUNITIES

ECO NO.	DESCRIPTION	SIR RANK	EXISTING ENERGY USAGE (MBTU/YR)	ESTIM.*** ENERGY SAVINGS (MBTU/YR)	ESTIMATED SAVINGS (\$000)	FY '85 CONST. COST (\$000)	SIMPLE PAYBACK PERIOD (YRS)	SAVINGS INVEST. RATIO (SIR)
7.6.9	STEAM DISTRIBUTION PRESSURE REDUCTION	1	712,480	142,158.0	240	108	0.45	42.92
7.6.10	BLOWDOWN CONTROL	2	53,302	4,046.5	7	11	1.58	12.24
7.6.15	REPLACEMENT DESUPERHEATERS	3	1,931.0	1,931.0	20	37	1.85	8.59
7.6.1	CONTROLS (OXYGEN TRIM ONLY)	4	1,829,110	25,286.0	43	119	2.78	6.86
7.6.8	VARIABLE SPEED CIRCULATION PUMPS	5	7,613	2,980.0	31	262	8.53	1.56
7.6.14	AUTOMATIC BOILER COMBUSTION CONTROLS	6	1,829,110	38,619.0	65	1,066	16.36	1.41

***ALL ENERGY SAVINGS ARE GAS

TABLE 2

FORT RICHARDSON

SUMMARY OF ENERGY CONSERVATION OPPORTUNITIES

NOT ELIGIBLE FOR ENERGY FUNDING

ECO NO.	DESCRIPTION	EXISTING ENERGY USAGE (MBTU/YR)	ESTIM.*** ENERGY SAVINGS (MBTU/YR)	ESTIMATED SAVINGS (\$000)	FY '85 CONST. COST (\$000)	SIMPLE PAYBACK PERIOD (YRS)	SAVINGS INVEST. RATIO (SIR)
7.6.11	AIR LEAKAGE	1,829,110	18,010	30	3,488	114.74	0.22
7.6.13A	VARIABLE SPEED INDUCED DRAFT FANS	5,620	2,074	21	305	14.31	0.91
7.6.13B	VARIABLE SPEED FORCED DRAFT FANS	1,452	628	6	157	24.28	0.44

***ALL ENERGY SAVINGS ARE GAS

TABLE 3

FORT RICHARDSON

SUMMARY OF ENERGY CONSERVATION OPPORTUNITIES

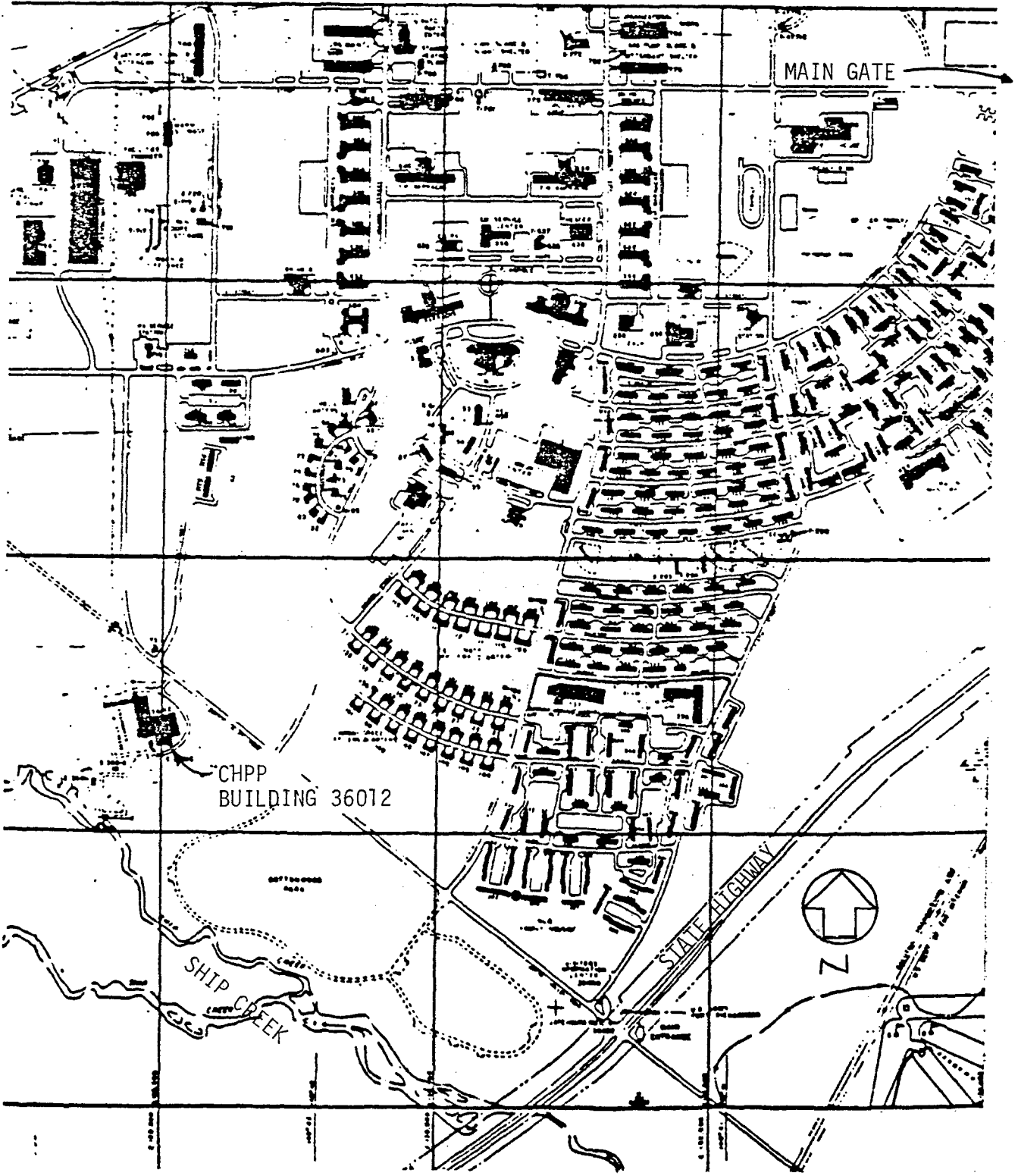
DOCUMENTED FOR FUNDING

ECO NO.	DESCRIPTION	SIR RANK	EXISTING ENERGY USAGE (MBTU/YR)	ESTIM.*** ENERGY SAVINGS (MBTU/YR)	ESTIMATED SAVINGS (\$000)	FY '85 CONST. COST (\$000)	SIMPLE PAYBACK PERIOD (YRS)	SAVINGS INVEST. RATIO (SIR)
7.6.9	STEAM DISTRIBUTION PRESSURE REDUCTION	OSD PIF 1	712,480	142,158.0	240	108	0.45	42.92
7.6.10	BLOW DOWN CONTROL	QRIP 2	53,302	4,046.5	7	11	1.58	12.24
7.6.15	REPLACEMENT DESUPERHEATER	QRIP 3	**	1,931.0	20	37	1.85	8.59
7.6.8	VARIABLE SPEED CIRCULATION PUMPS	ECIP 4	7,613	2,980.0	31	262	8.53	1.56
7.6.14	AUTOMATIC BOILER COMBUSTION CONTROLS <i>7.6.14</i>	1391 5*	1,829,110	38,619.0	65	1,066	16.36	1.18
7.6.11	AIR LEAKAGE - BOILER SETTING	1391 6*	1,829,110	18,010.0	30	3,488	114.74	0.17

* THESE PROJECTS HAVE BEEN PACKAGED FOR OMA FUNDING AS REQUESTED BY THE INSTALLATION.

** NOTE: COMPARABLE NUMBER NOT AVAILABLE.

*** ALL ENERGY SAVINGS ARE GAS.



FORT RICHARDSON SITE PLAN