CSHB 154 cont., thru HB 158

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Expenses"). Although the relatively large costs of issuance of the initial series of Insured Mortgage Program Bonds were paid from unrestricted surplus funds of the Corporation, all Program Expenses subsequently incurred (other than costs of issuance of subsequent series of Bonds which were paid from proceeds of such Bonds) have been paid by the Corporation from Pledged Receipts in respect of the mortgage loans securing the Bonds.

The 1977 First Series Bonds and all other Series of Bonds issued under the Resolution are secured on a parity. Additional Bonds may be issued upon compliance with the provisions of the Resolution which include the filing of a Certificate of an Authorized Officer stating, in substance, that anticipated Pledged Receipts and Recoveries of Principal (together with any other funds estimated to be available therefor) will be, in each year, sufficient to pay debt service and Program Expenses in such year. The Bonds are general obligations of the Corporation for which its full faith and credit is pledged, subject to any agreements heretofore or hereafter made with the holders of any notes or other bonds of the Corporation pledging any particular revenues or assets not pledged under the Resolution and the exclusion by the Act of a pledge of funds in the Housing Development Fund.

The State Mortgage Insurance Fund

Acquired Obligations (consisting of mortgage loans financed from Bond proceeds and other moneys available under the Resolution) will be of the type described under "The Insured Mortgage Program". Such mortgage loans will be insured by the Insurance Account within the State Mortgage Insurance Fund. The capital of the Insurance Account is required to be maintained in an amount at least equal to 2% of the unpaid principal amount of mortgage loans insured thereby. In the event of a deficiency in the Insurance Account, the Commissioner of Commerce and Economic Development of the State has covenanted to certify such deficiency to the Corporation which, to the extent it has unrestricted surplus funds available, will transfer an amount equal to the deficiency to the Insurance Account. To the extent the Corporation's unrestricted surplus funds are insufficient to restore the Insurance Account, the Commissioner will certify any remaining deficiency to the Governor and the Chairmen of the House and Senate Finance Committees of the State Legislature. The Act authorizes, but does not require, the Legislature to appropriate the amount so certified. For information concerning an anticipated appropriation of $2,000,000 by the State Legislature to the Insurance Account, see "The Insured Mortgage Program" elsewhere herein.

The Capital Reserve Fund

The Act and the Resolution provide for a Capital Reserve Fund to be held by the Trustee, which is required to have on deposit an amount equal to 10% of all Outstanding Bonds (the "Capital Reserve Fund Requirement"). In the event that other funds available to the Corporation under the Resolution are insufficient to pay when due interest on the Bonds or the principal or Redemption Price thereof (whether redeemed from Sinking Fund Payments or otherwise), the Trustee is required to apply amounts in the Capital Reserve Fund to make such payments. Except for such payments, no withdrawal may be made which will reduce the amount in the Capital Reserve Fund to less than the Capital Reserve Fund Requirement and the Corporation has covenanted to make no withdrawals therefrom unless it determines that the amounts withdrawn are not necessary to make the scheduled payments of principal and interest on outstanding Bonds. The Resolution also provides that after the required monthly application of Pledged Receipts for Program Expenses and for the payment of principal and interest on the Bonds, any amounts remaining are to be deposited in the Capital Reserve Fund to the extent necessary to meet the Capital Reserve Fund Requirement. In the event that a deficiency exists and other revenues or funds are insufficient to restore the Capital Reserve Fund to the Capital Reserve Fund Requirement, Section 18.56.125(e) of the Act provides as follows:

> "The chairman of the corporation shall annually, no later than January 2, make and deliver to the governor and chairmen of the house and senate finance commitees his certifi-

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cate stating the sum, if any, required to restore any capital reserve fund to the capital reserve fund requirement. The legislature may appropriate such a sum, and all sums appropriated during the then current fiscal year by the legislature for such restoration shall be deposited by the corporation in the proper capital reserve fund. Nothing in this section creates a debt or liability of the state."

The Corporation has covenanted in the Resolution to cause its Chairman to certify the amount of any deficiency in the Capital Reserve Fund at the time and in the manner required by the Act and to pay amounts received from any appropriation in respect thereof into the Capital Reserve Fund.

Under the Act and the Resolution, the Capital Reserve Fund may be funded from any money appropriated therefor by the State, from proceeds of the sale of Bonds or other money available to the Corporation therefor or from amounts received pursuant to loans by the Commissioner of Revenue of surplus State funds on such terms and conditions as the Commissioner and the Corporation may agree upon. Upon the issuance of the 1975 First Series Bonds, the Capital Reserve Fund was funded by a $500,000 loan from the Commissioner, of which $498,000 remains outstanding. A similar loan from the Commissioner in the amount of $2,500,000 will be used to meet the Capital Reserve Fund Requirement with respect to the 1977 First Series Bonds. The Resolution permits such loans to be repaid to the Commissioner directly from moneys in the Capital Reserve Fund, but only to the extent the amount therein exceeds the Capital Reserve Fund Requirement. With the issuance of the 1976 First Series and 1976 Second Series Bonds, Investment Securities* valued under the Resolution at $2,000,000 and $2,500,000, respectively, were purchased from proceeds of such Series and credited to the Capital Reserve Fund in satisfaction of the Capital Reserve Requirement with respect to such Series. When the Capital Reserve Fund is funded from the proceeds of Bonds, as well as by loans from the Commissioner, earnings of the Fund in excess of the Capital Reserve Fund Requirement attributable to amounts loaned by the Commissioner will be paid to the Commissioner.

APPLICATION OF 1977 FIRST SERIES BOND PROCEEDS

It is the Corporation's present intention to apply the proceeds of sale of the 1977 First Series Bonds approximately as follows:

Purchase of $ principal amount of mortgage loans	$
Payment of accrued interest on mortgage purchases and deposit in Interest Account	
Bond discount	
Costs of Issuance	
Total	$25,000,000

Accrued interest on the 1977 First Series Bonds to the date of delivery thereof will be deposited in the Interest Account.

DESCRIPTION OF THE 1977 FIRST SERIES BONDS

The 1977 First Series Bonds will be dated April 1, 1977 and will bear interest payable semi-annually on June 1 and December 1, commencing December 77 (eight months), at the rates, and will mature on the dates and in the amounts, set forth on the cover page hereof.

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* "Investment Securities" are defined to include (i) direct obligations of or obligations insured or guaranteed by the United States or agencies or instrumentalities thereof, (ii) bankers acceptances and certificates of deposit of banks having a combined capital and surplus of at least $200,000,000 or (iii) interest-bearing time deposits or certificates of deposit of banks collateralized by obligations of the type described in clause (i), or by obligations of the State of Alaska having a market value equal to any non-insured portion of any such deposit or certificate.

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The 1977 First Series Bonds will be issued as coupon bonds, in denominations of $5,000, registrable as to principal, or as fully registered Bonds in denominations of $5,000 or any authorized multiple thereof. Coupon Bonds and fully registered Bonds are interchangeable. For every exchange or transfer of the 1977 First Series Bonds, the Corporation or the Trustee may make a charge sufficient to reimburse it for any tax, fee or other governmental charge required to be paid with respect to such exchange or transfer.

The principal or Redemption Price, if any, of and interest on the 1977 First Series Bonds are payable at the corporate trust office of Bank of America National Trust and Savings Association, San Francisco, California, or at the option of the holder at

The maturity schedule for the 1977 First Series Bonds has been established on the assumption that Pledged Receipts will be received in accordance with the scheduled amortization of the underlying mortgage loans. Although it is likely that certain of such mortgage loans will be prepaid or that other circumstances will occur that will result in the receipt of Recoveries of Principal, the Corporation will either finance new mortgage loans in such manner as to produce an approximately equivalent flow of Pledged Receipts, or call Bonds at par.

The 1977 First Series Bonds are subject to redemption upon at least 30 days' notice as shown below.

Sinking Fund Redemption

The 1977 First Series Bonds due December 1, 2007 (the "Term Bonds") are subject to mandatory redemption in part by lot, at 100% of the principal amount thereof plus accrued interest to the date of redemption, from Sinking Fund Payments which are required to be made in amounts sufficient to redeem on December 1 of each year the principal amount of such Bonds specified for each of the years shown below:

Year	Principal Amount	Year	Principal Amount	Year	Principal Amount
1993	$	1998	$	2003	$
1994		1999		2004	
1995		2000		2005	
1996		2001		2006	
1997		2002		2007*	

* Final maturity.

The Sinking Fund Payments which the Corporation is required to make are sufficient in amount to retire all Term Bonds by maturity.

The amounts accumulated for each Sinking Fund Payment may be applied by the Trustee, at the direction of the Corporation, prior to the forty-fifth day preceding the due date of such Sinking Fund Payment, to the purchase or redemption of Term Bonds, at prices (including any brokerage and other charges) not exceeding the principal amount thereof, plus accrued interest to the date of purchase or redemption. Upon any such purchase or redemption an amount equal to the principal amount of the Bonds so purchased or redeemed shall be credited toward a part or all of one or more of such Sinking Fund Payments in direct chronological order.

Special Redemption

The 1977 First Series Term Bonds are subject to redemption at any time by operation of the 1977 First Series Special Redemption Account, in part, from

(a) unexpended 1977 First Series Bond proceeds transferred, at the election of the Corporation, to the 1977 First Series Special Redemption Account, and

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(b) Prepayments or Default Payments (or Sale Payments received in respect of mortgage loans purchased from Prepayments or Default Payments) which are received in respect of mortgage loans credited to the 1977 First Series Mortgage Loan Account and transferred at the election of the Corporation to the 1977 First Series Special Redemption Account

at 100% of the principal amount thereof, plus accrued interest to the date of redemption.

In the event of such partial redemption, the amount to be credited to the reduction of each Sinking Fund Payment as a result of the redemption of Term Bonds shall be determined on a pro rata basis, unless otherwise directed by the Corporation.

Optional Redemption

The 1977 First Series Bonds may be redeemed from any moneys available to the Corporation by operation of the General Redemption Account, at the election of the Corporation, at any time on and after December 1, 1987, either as a whole or in part and in such amounts of such maturity or maturities as selected by the Corporation (and by lot if less than all of a maturity is to be redeemed), at the following Redemption Prices, plus accrued interest to the date of redemption:

Period (Both Dates Inclusive)	Redemption Price (Expressed as a Percentage of Principal Amount)
December 1, 1987 to November 30, 1990	103%
December 1, 1990 to November 30, 1993	102
December 1, 1993 to November 30, 1996	101
December 1, 1996 and thereafter	100

Upon any purchase or redemption of the Term Bonds by use of moneys in the General Redemption Account, the amount of Sinking Fund Payments shall be reduced in such manner as the Corporation may direct.

SUMMARY OF CERTAIN PROVISIONS OF THE RESOLUTION

The Resolution contains various covenants and security provisions certain of which are summarized below. Reference should be made to the Resolution for a full and complete statement of its provisions.

Resolution Constitutes Contract (Section 202)

The provisions of the Resolution constitute a contract between the Corporation, the Trustee and the holders of the Bonds and the related coupons and the provisions, covenants and agreements to be performed by or on behalf of the Corporation shall be for the equal benefit, protection and security of the holders of any and all of such Bonds and coupons.

Provisions for Issuance of Bonds (Sections 204, 206 and 711)

The Resolution authorizes Bonds to be issued from time to time without limitation as to amount except as provided by law, subject to the terms, conditions and limitations established by the Resolution. The Bonds of a Series are to be executed by the Corporation and delivered to the Trustee for authentication and delivery only upon receipt by the Trustee of:

(1) A Counsel's Opinion to the effect, among other things, that the Bonds of such Series have been duly and validly authorized and issued in accordance with the Constitution

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and statutes of the State, including the Act as amended to the date of such Opinion, and in accordance with the Resolution;

(2) A written order as to the delivery of such Series;

(3) A copy of the Supplemental Resolution authorizing such Series;

(4) The amount of the proceeds of such Series to be deposited in any Fund or Account pursuant to the Resolution;

(5) Except in the case of Refunding Bonds, a certificate of an Authorized Officer stating that the Corporation is not in default in the performance of any of the covenants, conditions, agreements or provisions contained in the Resolution;

(6) Except in the case of Refunding Bonds, a certificate of an Authorized Officer setting forth for the current and each future Bond Year (i) separately, the amount of Pledged Receipts* and Recoveries of Principal** expected to be received in such Bond Year on all Acquired Obligations (exclusive of Acquired Obligations in default) and on the Mortgage Loans expected to be financed from the proceeds of the Bonds of such Series and (ii) the amount of Principal Installments and interest due in such Bond Year with respect to all Series of Bonds to be Outstanding immediately after the authentication and delivery of the Series of Bonds being issued, and showing that such Pledged Receipts and Recoveries of Principal (which may include Prepayments), together with any other revenues or funds estimated by the Corporation to be available therefor, are in each such Bond Year in excess of the amount of Principal Installments and interest due in such Bond Year with respect to all Bonds to be Outstanding immediately after the delivery of such Series of Bonds, and stating that the remaining balances will be sufficient to pay the Program Expenses estimated to be incurred by the Corporation; and

(7) Such further documents and moneys as are required by the provisions of the Resolution or any Supplemental Resolution.

The Corporation is not permitted to issue any obligations other than the Bonds or create any indebtedness which will be secured by a superior or equal charge or lien on the revenues or assets pledged under the Resolution, except that Series of Bonds may be issued as provided in the Resolution on a parity with the Bonds of all other Series and shall be secured by an equal charge and lien on such revenues and assets and payable equally therefrom. No Series of Bonds shall be issued unless the principal amount of all Bonds issued or to be issued shall not exceed any limitation imposed by law and unless, upon the issuance of such Bonds, the amount credited

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* "Pledged Receipts" means scheduled payments of principal and interest called for by any Acquired Obligation (i.e. a mortgage loan financed by the Corporation pursuant to the Resolution) and paid to the Corporation from any source, including both timely and delinquent payments with late charges (not retained by the Servicer), fees and charges and all other revenues and income paid to the Corporation on account of or in connection with any Acquired Obligation and, upon receipt thereof by the Corporation, all interest earned or gains realized upon the investment or deposit of amounts in any Fund or Account, but shall not include (i) Recoveries of Principal, (ii) any amount retained by any Servicer of any Acquired Obligation (other than the Corporation) as compensation for services rendered, (iii) Escrow Payments and any payments of ground rents, taxes, assessments or mortgage, fire or other hazard insurance premiums called for by any Acquired Obligation or any like payments or (iv) interest earned or gains realized on investments which the Resolution requires to be retained in a particular Fund or Account.

** "Recoveries of Principal" means all amounts received by the Corporation as a recovery of the principal amount of an Acquired Obligation (i) as a result of the acceleration of the due date of any Acquired Obligation through foreclosure or other proceedings taken in the event of default, including proceeds of insurance or condemnation, (ii) as a result of the prepayment of any Acquired Obligation, including the amount of any penalty, fee, premium or additional charge, but not including the amount retained by the Servicer thereof as additional compensation as a result of such prepayment and (iii) on account of the sale, assignment, endorsement or other disposition of any Acquired Obligation.

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to the Capital Reserve Fund shall not be less than the Capital Reserve Fund Requirement and the "Account Requirement", as defined in the Mortgage Insurance Agreement, is met. The Corporation has reserved the right to adopt one or more additional general bond resolutions and to issue other obligations.

Provisions for Refunding Issues (Section 207)

One or more Series of Refunding Bonds may be authenticated and delivered pursuant to the Resolution to refund any Outstanding Bonds. Refunding Bonds may be authenticated and delivered only upon receipt by the Trustee of irrevocable instructions to the Trustee to give due notice of the redemption of all Bonds to be refunded and to give published notice of the refunding of such Bonds and upon receipt of either (i) moneys sufficient to effect payment at the applicable Redemption Price of the Bonds to be refunded, together with interest accrued to the redemption date, or (ii) direct obligations of, or obligations insured or guaranteed by, the United States of America or agencies or instrumentalities thereof which by their terms will provide moneys sufficient to provide for the payment of such Redemption Price and accrued interest. Any such moneys or obligations shall be held irrevocably in trust under the Resolution.

Regulations with Respect to Exchanges and Transfers (Section 308)

For every exchange or transfer of Bonds pursuant to the Resolution, the Corporation or the Trustee may make a charge sufficient to reimburse it for any tax, fee or other governmental charge required to be paid with respect to such exchange or transfer. Neither the Corporation nor the Trustee is obliged (i) to make any such exchange or transfer of Bonds of any Series during the 60 days next preceding an Interest Payment Date on the Bonds of such Series or next preceding any selection of Bonds to be redeemed or thereafter until the first publication or mailing of any notice of redemption or (ii) to transfer or exchange any Bonds previously called for redemption.

Application of Bond Proceeds and Recoveries of Principal (Sections 401 and 402)

As soon as practicable upon the delivery of each Series of Bonds, other than Refunding Bonds, the amount necessary to cause the amount on deposit in the Capital Reserve Fund to equal the Capital Reserve Fund Requirement immediately after such delivery is required to be deposited in the Capital Reserve Fund. Proceeds of such Series of Bonds which are not to be deposited in the Capital Reserve Fund or in the Interest Account (as may be directed by a Supplemental Resolution) are to be deposited in the Mortgage Loan Account established for such Series.

Amounts in the respective Mortgage Loan Accounts, including proceeds of Bonds and Recoveries of Principal, may be applied only to the financing of Mortgage Loans, but only if the Mortgage securing such Mortgage Loan has been executed and recorded in accordance with existing laws. Each such Mortgage Loan shall:

(1) Constitute a first lien, subject only to Permitted Encumbrances*, on real estate in fee simple or on a leasehold having a remaining term, at the time such Mortgage Loan is acquired, which does not expire for such number of years as the Corporation shall determine to be appropriate to secure the Corporation's interest in the premises or as may be required in order to obtain an insurance or guaranty endorsement from a Qualified Mortgage Insurance Company or the United States of America or an agency, department or instrumentality thereof, including the Department of Housing and Urban Development, the Farmers Home Administration or the Veterans Administration;

* "Permitted Encumbrances" means liens, encumbrances, reservations and other imperfections of title as, in the judgment of the Corporation, do not materially impair the use or value of the premises or as to which appropriate steps, in the judgment of the Corporation, have been taken to secure the interest of the Corporation.

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(2) Be insured pursuant to the Mortgage Insurance Agreement;

(3) Be a Mortgage Loan for owner-occupied Residential Housing* for occupancy by one family and, in the case of rental occupancy, by not more than five additional families, the mortgagor of which must be eligible for assistance under the Act, as from time to time amended; and

(4) Be insured, at the sole expense of the mortgagor, by a mortgagee policy of title insurance issued by a title insurance company qualified to do business in the State and acceptable to the Corporation insuring the Corporation that the Mortgage on the premises is a valid and enforceable first mortgage, subject only to Permitted Encumbrances.

Recoveries of Principal may not be applied to the financing of new Mortgage Loans unless the Pledged Receipts and Recoveries of Principal (which may include Prepayments) expected to be received on such Mortgage Loans, together with any other revenues or funds estimated by the Corporation to be available therefor, will provide funds sufficient for the payment when due of the principal of and interest on all Outstanding Bonds. In the event that the maturities of a Series of Bonds were scheduled without anticipating the retirement of Bonds at maturity from Recoveries of Principal, Recoveries of Principal received with respect to Mortgage Loans financed by such Series of Bonds may also be applied to the financing of additional Mortgage Loans if (i) the aggregate amount of the monthly payments of principal and interest called for each month by the terms of the Mortgage Loans to be so financed is not less than the aggregate amount of the monthly payments of principal and interest called for each month on the original Mortgage Loans with respect to which such Recoveries of Principal were received and (ii) the Mortgage Loans to be so financed do not have a maturity date earlier than the date of the final Principal Installment on the Outstanding Bonds of such Series of Bonds. The purchase price (excluding accrued interest and Service Fees) for or net proceeds payable to the borrower with respect to Mortgage Loans financed by application of Recoveries of Principal shall not exceed the principal amount thereof.

Pledge Effected by the Resolution (Section 501)

The Pledged Receipts and Recoveries of Principal and all amounts held in any Fund or Account, including investments thereof, are pledged to secure the payment of the principal or Redemption Price, if any, of and interest on the Bonds (including the Sinking Fund Payments for the retirement thereof) in accordance with their terms and the provisions of the Resolution, subject only to the provisions of the Resolution permitting the application thereof for or to the purposes and on the terms and conditions therein set forth.

Establishment of Funds and Accounts (Section 502)

The Resolution establishes the following Funds and Accounts which are to be held by the Trustee:

(1) Mortgage Loan Fund,
  (a) Mortgage Loan Accounts (for each Series);

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* "Residential Housing" means dwelling accommodations without limitation as to form of lawful occupancy, whether rental, under contract, fee ownership, cooperative housing, condominium or other lawful form of ownership for Persons of Lower and Moderate Income, or for persons residing in Remote, Underdeveloped or Blighted Areas, including such other nonhousing facilities as may be incidental or appurtenant thereto.

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(2) Revenue Fund;

(3) Debt Service Fund,
  (a) Interest Account,
  (b) Principal Account;

(4) Redemption Fund,
  (a) General Redemption Account,
  (b) Special Redemption Accounts (for each Series);

(5) Capital Reserve Fund.

Mortgage Loan Fund (Section 503)

Recoveries of Principal received with respect to Mortgage Loans financed by such Series of Bonds or from other amounts within such Account, constitute part of the Mortgage Loan Account established for such Series and are to be deposited promptly with a Depositary and transmitted to the Trustee regularly or at least monthly. Except to the extent applied to the redemption of Bonds, amounts in the Mortgage Loan Accounts may be expended only to pay the cost of financing Mortgage Loans, to pay reasonable and necessary Costs of Issuance, to make deposits in the Principal Account as provided in a Supplemental Resolution or to pay the principal or Redemption Price, if any, of and the interest on the Bonds when due. At the direction of the Corporation, the Trustee may transfer amounts in any Mortgage Loan Account to the appropriate Account within the Redemption Fund or apply such amounts directly to the redemption, purchase or retirement of Bonds at any time that such Bonds shall be subject to redemption or payment from such amounts.

Revenue Fund (Section 504)

All Pledged Receipts are to be deposited promptly with a Depositary and transmitted to the Trustee at least monthly for deposit in the Revenue Fund. On the date following receipt each month of a statement of account by the Corporation as to the Pledged Receipts and Recoveries of Principal received during such month, but in any event not later than the last day of the month, the Trustee is required to make payments from the Revenue Fund as follows:

FIRST: To the Corporation for the payment of Program Expenses or the establishment of reserves therefor, the amount needed and required prior to the tenth day of the next succeeding month, to pay reasonable and necessary Program Expenses in accordance with the Annual Budget.

SECOND: Into the Interest Account, the amount necessary to increase the amount in such Account so that it equals unpaid interest on the Outstanding Bonds accrued and to accrue to the last day of the then current month.

THIRD: Into the Principal Account, assuming the accrual of principal on the same basis as interest accrues, the amount necessary to increase the amount in such Account so that it equals the amount of unpaid Principal Installments on the Outstanding Bonds accrued and to accrue to the end of the then current month.

FOURTH: Into the Capital Reserve Fund, the amount, if any, necessary to cause the amount in such Fund to equal the Capital Reserve Fund Requirement.

FIFTH: Into each Mortgage Loan Account, in the order in which such Accounts were created, the amount, if any, by which (i) the principal amount of the Outstanding Bonds of the Series with respect to which such Account was created plus the amount, if any, specified in a

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Supplemental Resolution or the certificate of an Authorized Officer, as an addition to provide funds for the redemption of Bonds from amounts in such Account exceeds (ii) the sum of the unpaid principal amount (exclusive of amounts in default) of Acquired Obligations financed or deemed to be financed by application of amounts relating to such Series plus the aggregate amount then on deposit in the Capital Reserve Fund (exclusive of any amount deposited in the Capital Reserve Fund in connection with the issuance of any Series from sources other than the proceeds of such Series), the Principal Account and the Redemption Fund.

SIXTH: To the Commissioner of Revenue of the State for deposit in the "Alaska Housing Finance Corporation Insured Mortgage Program Account" within the Insurance Fund, the amount which may be stated in the Certificate of an Authorized Officer as necessary to provide amounts for such purpose pursuant to the Mortgage Insurance Agreement.

Immediately prior to the making of such payments in each month the Trustee, to the extent provided pursuant to a Supplemental Resolution, is required to transfer to the Principal Account from the Mortgage Loan Account for a particular Series of Bonds, to the extent of moneys available therein and assuming the accrual of such amounts on the same basis as interest accrues, the amount of Recoveries of Principal scheduled for the payment of the Bonds of such Series in the certificate delivered upon the issuance of such Series.

The Trustee is authorized to permit the withdrawal by the Corporation in December of each year, immediately following the payments required above, of any amount remaining in the Revenue Fund free and clear of any lien or pledge created by or pursuant to the Resolution, for any lawful purpose of the Corporation consistent with its covenants with respect to tax exemption.

Debt Service Fund (Section 505)

The Trustee is directed to pay to the Paying Agents from the Principal Account the amount required to make principal payments when due and to pay from the Interest Account (i) on or before each Interest Payment Date, the amounts required for the payment of interest due on the Outstanding Bonds on such date and (ii) on or before the redemption date or date of purchase, the amounts required for the payment of accrued interest on Bonds redeemed or purchased. In addition, the amount accumulated in the Principal Account for a Sinking Fund Payment may and, if directed by the Corporation, is required to be applied by the Trustee prior to the forty-fifth day preceding the due date of such Sinking Fund Payment to the purchase or redemption of Bonds of the Series and maturity for which such Sinking Fund Payment was established at prices not exceeding the Redemption Price which would be payable for such Bonds upon redemption by application of such Sinking Fund Payments and upon any such purchase or redemption an amount equal to the principal amount of such Bonds is to be credited toward such Sinking Fund Payment. The amount of any excess of the principal amounts so credited over the amount of such Sinking Fund Payment is to be credited against future Sinking Fund Payments for such Series in direct chronological order.

As soon as practicable after the forty-fifth day preceding the due date of any Sinking Fund Payment, the Trustee is to proceed to call for redemption on such due date Bonds of the Series and maturity for which such Sinking Fund Payment was established in a principal amount equal to the amount of such Sinking Fund Payment reduced by crediting thereto the principal amount of Bonds purchased or redeemed as described above. The Trustee is required to call such Bonds for redemption whether or not it then has moneys in the Principal Account sufficient to pay the applicable Redemption Price on the Redemption Date.

Redemption Fund (Section 506)

There are to be deposited in the General Redemption Account and the Special Redemption Accounts any amounts required to be deposited therein by the Resolution or any Supplemental

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Resolution and any other amounts available therefor and determined by the Corporation to be deposited therein. Subject to the provisions of the Resolution or of any Supplemental Resolution requiring the application thereof to the purchase or redemption of any particular Bonds, the Trustee is required to apply the amounts deposited in any Special Redemption Account to the purchase or redemption of any of the Bonds of the Series with respect to which such Account was created at the time and in the manner provided in the Resolution and amounts in the General Redemption Account are to be applied to the purchase or redemption of Bonds at the election of the Corporation. Prior to the forty-fifth day upon which Bonds are to be redeemed from such amounts, the Trustee may apply amounts in any Account within the Redemption Fund to the purchase of any of such Bonds, except that the Corporation may require or prohibit such purchases. The purchase price paid for any Bond may not exceed the principal amount of such Bond unless such Bond may be redeemed within 13 months after such purchase in which event such price shall not exceed the applicable Redemption Price. If the Corporation is able to redeem a principal amount of Bonds equal to the amounts deposited in such Account any balance of the moneys remaining in such Account after such redemption is to be deposited in the Revenue Account.

Upon the purchase or redemption of Bonds of any Series and maturity for which Sinking Fund Payments have been established from amounts in any Special Redemption Account, each future Sinking Fund Payment for such Bonds will be credited by an amount bearing the same ratio to such Sinking Fund Payments as the total principal amount of such Bonds so purchased or redeemed bears to the total amount of all such Sinking Fund Payments.

On or before the redemption date, the Trustee is required to pay to the Paying Agents from the applicable Account within the Redemption Fund the amounts required for the payment of the Redemption Price on any Bonds to be redeemed. When none of the Bonds of the Series relating thereto remain outstanding, a Special Redemption Account will be closed and the amounts therein will be withdrawn and deposited in the Revenue Fund. Except for amounts required to be retained therein for the redemption of Bonds for which notice of redemption has been given or for which the Trustee has received irrevocable instructions to give such notice on a future date, amounts in any Account in the Redemption Fund may be transferred to the Principal Account at the written request of an Authorized Officer of the Corporation.

Capital Reserve Fund (Sections 507 and 712)

If the amounts on deposit in the Principal Account or Redemption Fund and the Interest Account are less than the amounts required for the payments due on the Bonds on any Interest Payment Date or redemption date, the Trustee is to apply amounts from the Capital Reserve Fund to the extent required to make good the deficiencies.

The Corporation has covenanted, in compliance with the provisions of the Act, to cause the Chairman annually, on or before the second day of January of each year, to make and deliver to the Governor of the State his certificate stating the amount, if any, required to restore the Capital Reserve Fund to the Capital Reserve Fund Requirement. All moneys received by the Corporation from the State in accordance with the provisions of the Act pursuant to any such certification are to be paid to the Trustee for deposit and credit to the Capital Reserve Fund.

Amounts loaned to the Corporation pursuant to the Act for deposit in the Capital Reserve Fund are to be deposited in a special Account within the Capital Reserve Fund. All interest earned or gains realized as a result of the investment of amounts in such special Account are required to be retained therein. The Trustee may pay out any amount required to be paid to the State pursuant to the terms of any such loan, but only on December 2 of each year and only to the extent that such withdrawal shall not cause the amount on deposit in the Capital Reserve Fund to be less than the Capital Reserve Fund Requirement.

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All income earned or gains realized as a result of investment of amounts on deposit in the Capital Reserve Fund are to be deposited therein. Whenever the Corporation causes Bonds to be redeemed from amounts on deposit in any other Fund or Account, the Trustee is required to apply amounts in the Capital Reserve Fund to the redemption of Bonds to the extent that such amounts would exceed the Capital Reserve Fund Requirement immediately following such redemption. If, concurrently with the monthly transfers of funds from the Revenue Fund, the amount on deposit in the Capital Reserve Fund shall be in excess of the Capital Reserve Fund Requirement, the Trustee, at the direction of an authorized officer of the Corporation, is to transfer (to the extent available other than from the special loan Account described above) the amount of such excess to the Revenue Fund. Bonds to be redeemed from amounts in the Capital Reserve Fund shall be selected in such manner as the Corporation shall specify in written instructions or, failing such instructions, as the Trustee shall, in its discretion, deem advisable.

Whenever the amount in the Capital Reserve Fund (other than in the special loan Account therein) together with the amount in the Debt Service Fund, is sufficient to pay the principal of and interest on all Outstanding Bonds (including the Sinking Fund Payments for the retirement thereof), all amounts on deposit in the Capital Reserve Fund (other than special loan Account funds) are to be transferred to the appropriate Account in the Debt Service Fund.

Deposits and Investments (Sections 509 and 510)

All amounts held by the Trustee, any Paying Agent or any Depositary under the Resolution may be placed on demand or time deposit. All amounts held under the Resolution which are not held in trust for the payment of particular Bonds or which do not represent an investment of amounts held thereunder must be continuously and fully secured for the benefit of the Corporation and the holders of the Bonds by lodging Investment Securities with the Trustee or in such other manner as may then be required by applicable federal or state laws regarding the deposit of trust funds. In computing the amount in any Fund or Account, obligations purchased as an investment of moneys therein shall be valued at par if purchased at par value or at amortized value if purchased at other than par value. Valuation shall be made on the tenth day prior to each Interest Payment Date and, except in the case of the Capital Reserve Fund, on any particular date shall not include the amount of interest then earned or accrued to such date on any such moneys or investment.

Payment of Bonds (Section 701)

The Corporation covenants that it shall duly and punctually pay or cause to be paid the principal or Redemption Price, if any, of every Bond and the interest thereon, at the dates and places and in the manner stated in the Bonds and in the coupons thereto appertaining, according to the true intent and meaning thereof, and shall duly and punctually pay or cause to be paid all Sinking Fund Payments, if any, becoming payable with respect to any Series of Bonds.

Powers as to Bonds and Pledge (Section 705)

The Corporation covenants that it is duly authorized pursuant to law to authorize and issue the Bonds and to adopt the Resolution and to pledge the assets and revenues purported to be pledged by the Resolution in the manner and to the extent provided in the Resolution.

Tax Covenants (Section 706)

The Corporation covenants that (i) it will not permit at any time or times any of the proceeds of the Bonds or other funds of the Corporation to be used directly or indirectly to acquire any securities or obligations the acquisition of which would cause any Bond to be an

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"arbitrage bond" as defined in Section 103(c)(2) of the Internal Revenue Code of 1954, as amended, and (ii) except in the case of Bonds held by a "substantial user" or "related person" within the meaning of Section 103(b)(7) of such Code, it will not permit such proceeds or other funds to be used in such manner as would result in the exclusion of any Bond from the treatment afforded by Section 103(a) of such Code by reason of the classification of such Bond as an "industrial development bond" within the meaning of said Code. It is expressly provided in the Resolution that the Corporation shall require that no person or "related person" shall purchase Bonds in an amount related to the Mortgage Loans to be acquired by the Corporation from such person or "related person".

Accounts and Reports (Section 707)

The Corporation covenants that it will keep, or cause to be kept, proper books of record and account in which complete and accurate entries shall be made of all its transactions relating to the Insured Mortgage Program and all Funds and Accounts established by the Resolution which shall at all reasonable times be subject to the inspection of the Trustee and the holders of an aggregate of not less than 5% in principal amount of Bonds then Outstanding or their representatives duly authorized in writing.

On or before the twenty-fifth day of each month or as soon as practicable thereafter, the Corporation is required to submit to the Trustee a statement of account for the preceding month setting forth the individual totals of the amounts received as Recoveries of Principal and Pledged Receipts during such month.

The Corporation must annually, within 90 days after the close of each Bond Year, file with the Trustee, and with such officials of the State, if any, as may be required by the Act, as amended, (1) a copy of an annual report for such Bond Year, setting forth its operations and accomplishments during such Bond Year and (2) financial statements of the Corporation for such Bond Year setting forth in reasonable detail: (a) a statement of revenues and expenses in accordance with the categories or classifications established by the Corporation for its Insured Mortgage Program purposes, (b) a balance sheet for the Insured Mortgage Program showing its assets and liabilities at the end of such Bond Year and (c) a statement of changes in financial position for the Insured Mortgage Program for such Bond Year. The financial statements for the Insured Mortgage Program may be combined with financial statements for other programs and purposes of the Corporation so long as the said financial statements for the Insured Mortgage Program are separately identified. The financial statements shall be accompanied by the report of an accountant stating that the financial statements examined present fairly the financial position of the Corporation at the end of the Bond Year, the results of its operations and the changes in financial position for the period examined, in conformity with generally accepted accounting principles. A copy of each such annual report and accountant's report shall be mailed promptly thereafter by the Corporation to each Bondholder who shall have filed his name and address with the Corporation for such purpose.

Budgets (Section 708)

The Corporation shall prepare a preliminary budget covering its operating expenses for the succeeding year at least 60 days prior to December 1 of each year and a summary of such budget which shall be mailed to Bondholders who have filed their names and addresses with the Corporation for such purpose. The Corporation shall hold a public hearing on the budget if requested by the Holders of 10% or more of the Outstanding Bonds in the manner provided by the terms of the Resolution.

The Corporation shall adopt an Annual Budget covering its fiscal operations for the succeeding Bond Year not later than December 1 of each year, and file the same with the Trustee

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and with such officials of the State as may be required by the Act, as then amended. The Annual Budget shall at least set forth for such Bond Year the estimated Pledged Receipts, Recoveries of Principal, Principal Installments and interest due and payable or estimated to become due and payable during such Bond Year and estimated Program Expenses. Whenever the Corporation anticipates that the amounts required for the payment of Operating Expenses will be in excess of the amounts provided in the Annual Budget, the Corporation shall and at any time may adopt and file with the Trustee an amended annual budget for the remainder of the then current Bond Year in the manner provided in the Resolution for the adoption of the Annual Budget. Copies of the Annual Budget and any amended Annual Budget shall be made available by the Trustee for inspection by any Bondholder.

Insured Mortgage Program (Section 709)

The Corporation from time to time, with all practical dispatch and in a sound and economical manner consistent in all respects with the Act, with the provisions of the Resolution and with sound banking practices and principles, shall (i) use and apply the proceeds of the Bonds (to the extent not reasonably or otherwise required for other purposes of the Insured Mortgage Program) to purchase or make Mortgage Loans, (ii) do all such acts and things necessary to receive and collect Pledged Receipts and, when applicable, Recoveries of Principal sufficient to pay Program Expenses and principal or Redemption Price, if any, of and interest on the Bonds and (iii) diligently enforce, and take all steps, actions and proceedings reasonably necessary in the judgment of the Corporation to maintain any insurance on Acquired Obligations and to enforce all terms, covenants and conditions of Acquired Obligations.

The Corporation covenants not to sell or assign an Acquired Obligation, other than for the purpose of realizing the benefits of mortgage insurance with respect thereto, unless the amounts received in respect thereof shall be deposited in the appropriate Mortgage Loan Account and the Corporation shall have determined that there shall as a result of such sale be no material adverse effect on the ability of the Corporation to pay all Principal Installments and interest on Outstanding Bonds. Subject to such provisions, the Corporation may sell or assign any Acquired Obligation, and the Acquired Obligation so sold or assigned shall be released from the lien of the pledge of the Resolution.

The Corporation covenants not to terminate, modify or amend the Mortgage Insurance Agreement, but shall maintain and keep the same in full force and effect, shall not release or modify the obligation of the Commissioner of Commerce and Economic Development under the Mortgage Insurance Agreement, shall take all reasonable measures permitted by the Mortgage Insurance Agreement or otherwise by law to enforce prompt payment to it of any amounts due thereunder and shall at all times defend, enforce, preserve, and protect the rights, benefits and privileges of the Corporation, the Trustee and the holders of the Bonds under the Mortgage Insurance Agreement.

Powers of Amendment (Section 902)

Any modification or amendment of any provision of the Resolution or of the rights and obligations of the Corporation and of the holders of the Bonds and coupons may be made by a Supplemental Resolution, with the written consent given as provided in the Resolution (a) of the holders of at least two-thirds in principal amount of the Outstanding Bonds, (b) in case less than all of the several Series of Bonds would be affected by such modifications or amendment, of the holders of at least two-thirds in principal amount of the Outstanding Bonds of each Series so affected, or (c) in case the modification or amendment changes the terms of any Sinking Fund Payment, of the holders of at least two-thirds in principal amount of the Outstanding

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Bonds of the particular Series and maturity entitled to such Sinking Fund Payment; except that if such modification or amendment will, by its terms, not take effect so long as any Bonds of any specified like Series and maturity remain Outstanding, the consent of the holders of such Bonds shall not be required. No such modification or amendment shall permit a change in the terms of redemption or maturity of the principal of any Outstanding Bond or of any installment of interest thereon or a reduction in the principal amount or the Redemption Price thereof or in the rate of interest thereon without the consent of the holder of such Bond or shall reduce the percentages or otherwise affect the classes of Bonds, the consent of the holders of which is required to effect any such modification or amendment.

Events of Default (Section 1002)

Each of the following events is an "Event of Default": (a) the Corporation shall default in the payment of the principal or Redemption Price of any Bond when and as the same shall become due, whether at maturity or upon call for redemption or otherwise; (b) payment of any installment of interest on any of the Bonds shall not be made within 30 days after the same shall become due; (c) the Corporation shall fail to comply with the provisions of the Resolution and the Act regarding certification to the Governor and the Legislature; (d) the Commissioner of Commerce and Economic Development shall fail to make the certification required pursuant to the Mortgage Insurance Agreement; or (e) the Corporation shall fail to comply with the provisions of the Resolution, or shall default in the performance or observance of any of the covenants, agreements or conditions contained therein, or in any Supplemental Resolution or the Bonds, and such failure, refusal or default shall continue for a period of 45 days after written notice thereof by the Trustee or the holders of not less than 5% in principal amount of the Outstanding Bonds.

Remedies (Section 1003)

Upon the happening and continuance of any Event of Default specified in clauses (a), (b) and (c) above, the Trustee shall proceed, or upon the happening and continuance of any event of default specified in clauses (d) and (e) above, the Trustee may proceed, and upon the written request of the holders of not less than 25% in principal amount of the Outstanding Bonds, shall proceed, in its own name, subject to the Resolution, to protect and enforce its rights and the rights of the Bondholders by such of the following remedies as the Trustee, being advised by counsel, shall deem most effectual to protect and enforce such rights: (a) by mandamus or other suit, action or proceeding at law or in equity, to enforce all rights of the Bondholders, including the right to require the Corporation to receive and collect revenues and assets, including Pledged Receipts and Recoveries of Principal adequate to carry out the covenants and agreements as to, and pledge of, such revenues and assets, and to require the Corporation to carry out any other covenant or agreement with Bondholders and to perform its duties under the Act; (b) by bringing suit upon the Bonds; (c) by action or suit in equity, to require the Corporation to account as if it were the trustee of an express trust for the holders of the Bonds; (d) by action or suit in equity, to enjoin any acts or things which may be unlawful or in violation of the rights of the holders of the Bonds; (e) by declaring all Bonds due and payable, and if all defaults shall be made good, then, with the written consent of the holders of not less than 25% in principal amount of the Outstanding Bonds, by annulling such declaration and its consequences; or (f) in the event that all Bonds are declared due and payable, by selling Acquired Obligations.

Compensation of Trustee (Section 1105)

The Corporation is required to pay to the Trustee and to each Paying Agent from time to time reasonable compensation for all services rendered under the Resolution, and also all reason-

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able expenses, charges, counsel fees and other disbursements, including those of their attorneys, agents and employees, incurred in and about the performance of their powers and duties under the Resolution, and the Trustee and each Paying Agent shall have a lien therefor on any and all funds at any time held by it under the Resolution.

Defeasance (Section 1201)

If the Corporation shall pay or cause to be paid to the holders of the Bonds and coupons, the principal and interest and Redemption Price, if any, to become due thereon, at the times and in the manner stipulated therein and in the Resolution, then the pledge of any revenues and assets thereby pledged and all other rights granted thereby shall be discharged and satisfied.

Bonds or coupons or interest installments for the payment or redemption of which moneys have been set aside and held in trust by Fiduciaries (through deposit by the Corporation of funds for such payment or redemption or otherwise) at the maturity or redemption date thereof will be deemed to have been paid within the meaning and with the effect expressed in the preceding paragraph. Any Outstanding Bonds and all coupons appertaining to such Bonds shall prior to the maturity or redemption date thereof be deemed to have been paid within the meaning and with the effect so expressed if (a) in case any of said Bonds are to be redeemed on any date prior to their maturity, the Corporation shall have given to the Trustee in form satisfactory to it irrevocable instructions to publish, as provided in the Resolution, notice of redemption on said date of such Bonds, (b) there shall have been deposited with the Trustee either moneys in an amount which shall be sufficient, or direct obligations of or obligations guaranteed by the United States of America the principal of and the interest on which when due will provide moneys which, together with the moneys, if any, deposited with the Trustee at the same time, shall be sufficient to pay when due the principal or Redemption Price, if applicable, and interest due and to become due on said Bonds on and prior to the redemption date or maturity date thereof, as the case may be and (c) in the event said Bonds are not by their terms subject to redemption within the next succeeding 60 days, the Corporation shall have given the Trustee in form satisfactory to it irrevocable instructions to publish, as soon as practicable, at least twice, at an interval of not less than seven days between publications, in an Authorized Newspaper a notice to the holders of such Bonds and coupons that the deposit required by (b) above has been made with the Trustee and that said Bonds and coupons are deemed to have been paid and stating such maturity or redemption date upon which moneys are to be available for the payment of the principal or Redemption Price, if applicable, of said Bonds. Neither the obligations nor the moneys so deposited with the Trustee nor principal or interest payments on any such obligations shall be withdrawn or used for any purpose other than, and shall be held in trust for, the payment of the principal or Redemption Price, if applicable, and interest on said Bonds, but any cash received from such principal or interest payments on such obligations deposited with the Trustee, if not then needed for such purpose, shall, to the extent practicable, be reinvested in obligations maturing at times and in amounts sufficient to pay when due the principal or Redemption Price, if applicable, and interest to become due on said Bonds on and prior to such redemption date or maturity date thereof, as the case may be, and interest earned from such reinvestments shall be paid over to the Corporation, as received by the Trustee, free and clear of any trust, lien or pledge.

SUMMARY OF CERTAIN PROVISIONS OF THE MORTGAGE INSURANCE AGREEMENT

Provisions of the Act create a State Mortgage Insurance Fund held by the Commissioner of Revenue of the State and administered by the Commissioner of Commerce and Economic Development of the State and the Corporation for the purpose of insuring eligible mortgage

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loans. The provisions have been implemented by a Mortgage Insurance Agreement dated as of December 6, 1975, between the Commissioner of Commerce and Economic Development and the Corporation. Certain provisions of the Agreement and the Act are summarized below. Reference should be made to the Agreement and the Act for a complete statement of their provisions.

Creation of Account

The Agreement creates within the Insurance Fund a special account designated as the Alaska Housing Finance Corporation Insured Mortgage Program Account (the "Insurance Account"). No amounts deposited in the Insurance Account may be withdrawn except as permitted by the Agreement.

Mortgages Eligible for Insurance by the Account

Mortgage loans which may be insured by the Insurance Account are limited to Acquired Obligations pledged to the payment of the Bonds. In addition, no mortgage loan will be eligible for insurance by the Insurance Account unless such mortgage loan, upon becoming an Acquired Obligation, shall have a loan to value ratio* of less than 80% or shall be the subject of insurance or guarantee by the FHA, VA or other federal agency or by a Qualified Mortgage Insurance Company** to the extent that the loan to value ratio is equal to or greater than such ratio.

Other accounts in addition to the Insurance Account may be subsequently established within the Insurance Fund to insure other mortgage loans or obligations so long as claims for losses with respect to such obligations are not payable from, and shall not obligate, encumber or create any charge against, or liability with respect to, amounts in the Insurance Account. The Agreement further provides that no such other account shall be established with a priority over the Insurance Account with respect to payments received pursuant to the Act from any appropriations by the State or from unrestricted surplus funds of the Corporation.

The Account Requirement and Administration of the Insurance Account

The Act provides that mortgage loans may be insured by the Insurance Fund if the amount therein is equal to the greater of (a) 2% of the unpaid principal amount of the mortgage loans insured, or (b) such other percentage as the Corporation with the approval of the Commissioner of Commerce and Economic Development determines is "actuarially sound" for operation of the Fund. In making such determination, the Act requires that various factors be considered, including estimates of future defaults and losses on mortgage loans insured based on actual default and loss experience of mortgage loans in Alaska or elsewhere, estimates of recoveries on defaulted or foreclosed mortgage loans based on such experience, the terms and conditions of the mortgage loans insured, estimates of earnings and income of amounts in the Insurance Fund, and any other appropriate factors. The Agreement establishes for the Insurance Account an Account Requirement with respect to Acquired Obligations to be insured thereby which is determined as provided in the Act and as described below. At February 28, 1977, cash and securities of $ was on deposit in the Insurance Account.

Pursuant to the Agreement, the Insurance Account was initially funded by a deposit of $100,000 from the Corporation's unrestricted surplus funds in connection with the issuance of $5,000,000 1975 First Series Bonds. Effective July 1, 1976, the Legislature of the State appro-

* Loan to value ratio means the ratio of the principal amount of the mortgage loan to the appraised value, as determined by an appraiser acceptable to the Corporation, of the residential housing securing the mortgage loan.

** A Qualified Mortgage Insurance Company is a mortgage insurance company satisfactory to the Corporation, qualified to do business in the State and to provide insurance on mortgages purchased by the Federal Home Loan Mortgage Corporation or the Federal National Mortgage Association.

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priated $500,000 for Insurance Account purposes, of which amount $391,000 has been paid to the Insurance Account as requested by the Corporation in connection with the issuance of the 1976 First Series and 1976 Second Series Bonds. Pursuant to the terms of such appropriation, the Corporation had made matching payments of $391,000 to the Insurance Account (in addition to the $100,000 initially deposited therein) from its unrestricted surplus funds. In connection with the issuance of the 1977 First Series Bonds, the State and the Corporation will each deposit $109,000 in the Insurance Account pursuant to the terms of the initial $500,000 appropriation. A bill has been introduced in the Alaska Legislature providing for an appropriation to the Corporation of $2,000,000 for the purposes of its Insured Mortgage Program. The Bill has passed the House of Representatives unanimously and, although no assurances can be made, the Corporation expects it to be enacted into law. Pursuant to the provisions of the bill the Corporation will request that the entire $2,000,000 be deposited directly in the Insurance Account of the State Mortgage Insurance Fund where it will increase the amount presently on deposit therein to % of the estimated principal amount of the Mortgage Loans insured thereby following the application of 1977 First Series Bond proceeds to the purchase of Mortgage Loans. The appropriation does not require any matching contribution to the Insurance Account by the Corporation. Since the Insurance Account is required to be maintained in an amount at least equal to 2% of the unpaid principal amount of the Mortgage Loans so insured, additional Mortgage Loans may be purchased by the Corporation without the necessity of further deposits to the Insurance Account.

Income of the Insurance Account is to consist of the amortization of any insurance premiums collected by the Corporation in respect of mortgage loans to be insured over the estimated average life of such mortgage loans, net earnings on investments in the Insurance Account and such other fees, charges and receipts as the Commissioner of Commerce and Economic Development and the Corporation may prescribe and collect. At the end of each Bond Year, the capital of the Insurance Account shall be increased by the amount by which the portion of premium income earned, if any, and all investment income of the Insurance Account exceeds losses during such year or decreased by the amount by which losses to the Insurance Account exceed such income. Except to the extent necessary to satisfy claims for losses on Acquired Obligations, amounts may be withdrawn from the capital of the Insurance Account only to reimburse the Corporation for capital contributions to the Insurance Account and then only if the capital has not been less than the Account Requirement at any time within the two years preceding such withdrawal and the withdrawal will not cause the capital of the Insurance Account to be less than the Account Requirement, and only to the extent that such withdrawals represent reimbursement to the Corporation for contributions to the capital of the Account which have not been reimbursed by previous withdrawals.

The Agreement provides that the Insurance Account shall be administered in such a manner that its income in each Bond Year is expected to at least equal the anticipated claims for losses in such Bond Year. If income is less than losses in any Bond Year, the Agreement requires the Commissioner of Commerce and Economic Development and the Corporation to (a) adjust the level of future insurance premiums charged by the Corporation, (b) determine that the Account Requirement requires the capital of the Insurance Account to be increased to a level which will provide adequate investment income or (c) take a combination of such actions, so as to ensure that income of the Insurance Account in future Bond Years will equal losses in such Bond Years.

Deficiencies in the Insurance Fund

With respect to deficiences in the Insurance Fund, Section 18.56.095(f) of the Act provides as follows:

> "On December 1 of each year the commissioner of commerce [and economic development] shall determine the amount on deposit in the mortgage insurance fund. If the amount in

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the fund is less than the fund requirement, the commissioner shall request the corporation to transfer from any available funds the amount necessary to restore the mortgage insurance fund to the fund requirement and the corporation shall promptly comply with the request from any funds available subject to agreements with holders of any of its obligations. If sufficient funds are not provided as the result of such requests, the commissioner shall, no later than January 2 of the following year, make and deliver to the governor and to the chairmen of the house and senate finance committees his certificate stating the sum required to restore the fund to the fund requirement and the sum so certified may be appropriated and paid to the fund during the then current state fiscal year. Nothing in this subsection creates a debt or liability of the state."

In the Agreement, the Commissioner of Commerce and Economic Development and the Corporation have covenanted to determine the Account Requirement from time to time and at least annually on December 1. If, in such annual determination, the amount on deposit in the capital of the Insurance Account is less than the Account Requirement, the Commissioner has covenanted to certify to the Corporation the amount of any deficiency and the Corporation has covenanted, to the extent it has unrestricted surplus funds available for such purpose, to transfer to the Insurance Account the amount of such deficiency. If sufficient funds are not available to the Corporation, the Commissioner of Commerce and Economic Development has covenanted to certify, at the time and in the manner required by the Act, such sum to the Governor and Chairmen of the House and Senate Finance Committees of the State Legislature as is necessary to restore the Insurance Account to the amount required by the Act. The Agreement provides that any sum appropriated in connection with any such certification shall be promptly paid in as part of the capital of the Insurance Account.

With respect to funds available to the Corporation to restore any deficiency in the Insurance Account, the Resolution provides that, after the required monthly deposits of revenues into the Funds and Accounts under the Resolution, any amounts remaining will be transferred to the Insurance Account to the extent certified by the Corporation as necessary to make up any deficiency. In addition, the Corporation may restore the Insurance Account from other available unrestricted surplus funds. In the absence of a deficiency in the Insurance Account, there is no requirement that present or future surplus funds, including any surplus under the Resolution, be retained by the Corporation for purposes of the Insurance Account, and such funds may be expended for general operating or other purposes of the Corporation. The Corporation's unrestricted surplus funds are principally provided by mortgage loans and investments purchased with proceeds of its bond anticipation notes and mortgage purchase commitment fees. However, there can be no assurance that in the event of a future deficiency in the Insurance Account the Corporation will have surplus funds available therefor.

Claims and Payment of Losses

Claims submitted by the Corporation in respect of Acquired Obligations insured by the Insurance Account may include unpaid principal and interest and unpaid expenses to the Corporation for real estate taxes, hazard and loan insurance premiums, repair and maintenance costs, collection and legal costs and similar costs. The Corporation, however, shall not be deemed to have incurred a loss in respect of an Acquired Obligation which is guaranteed or insured by the VA, FHA or other federal agency or by a Qualified Mortgage Insurance Company until it shall have first failed to obtain full and complete reimbursement of the loss from such guarantor or insurer.

Upon submission of a claim for loss, the Agreement provides that the Corporation shall establish the amount of loss on an Acquired Obligation by acquisition and sale of the mortgaged premises, by foreclosure or otherwise or by such other procedure as the Corporation may

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elect. Upon such determination, the Commissioner of Commerce and Economic Development shall promptly pay the amount of the loss established by the Corporation from the Insurance Account.

If at any time after payment from the Insurance Account to the Corporation for a loss on an Acquired Obligation, the Corporation recovers moneys in respect of the Acquired Obligation from another source, the Act and the Agreement require the Corporation to apply such moneys to repay the State to the extent of any prior appropriations into the Insurance Account pursuant to the Act and thereafter to reimburse the Insurance Account for its prior payment for such loss.

Incontestability of Insurance

Under the Agreement, upon the Corporation's endorsement of insurance of an Acquired Obligation by the Insurance Account, such insurance shall be valid and incontestable regardless of any deficiency or defect in the Acquired Obligation, and there are no conditions to such insurance except as provided in the Agreement.

Insurance Account Investments

The Agreement limits investments of moneys in the Insurance Account to (a) direct obligations of, or obligations insured or guaranteed by, the United States or its agencies or instrumentalities, (b) bankers acceptances drawn on and accepted by and certificates of deposit of banks with a combined capital and surplus aggregating at least $200,000,000 or (c) interest-bearing deposits or certificates of deposit of a bank or trust company continuously secured by obligations of the types described in clause (a) above or by obligations of the State having a market value at all times at least equal to the amount of such deposit or certificate to the extent not insured by the Federal Deposit Insurance Corporation or the Federal Savings and Loan Insurance Corporation, or any successors thereto.

Any amounts on deposit in the Insurance Account and investments thereof shall be in the custody of the Commissioner of Revenue and deposited in a segregated account in a bank or trust company having a capital and surplus of at least $25,000,000.

Other Covenants

The Commissioner of Commerce and Economic Development has covenanted to maintain the Insurance Account in accordance with sound commercial practice, and the Corporation has covenanted to supervise its portfolio of Acquired Obligations and to maintain full benefits under any prior insurance or guarantee to which it is entitled, but the failure to do so shall not relieve the Commissioner of Commerce and Economic Development from the payment of losses from the Insurance Account as provided in the Agreement.

The State pledges and agrees with the holders of Bonds that it will not limit or alter the rights and powers of the Commissioner to fulfill the terms of the Agreement or impair the right of the Corporation to receive insurance from the Insurance Account in respect of Acquired Obligations.

The Commissioner of Commerce and Economic Development and the Commissioner of Revenue have covenanted to maintain at all times complete and accurate books and records for purposes of the Agreement and, pursuant to the Agreement, have delegated such responsibility to the Corporation. The Agreement provides that such books and records shall be audited at least annually by an independent certified public accountant.

The Corporation has covenanted to maintain complete and accurate books and records regarding Acquired Obligations, which may be inspected by the Commissioner of Commerce

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and Economic Development for the purpose of verifying insurance claims against the Insurance Account.

Delegation by Commissioner

In the Agreement the Commissioner of Commerce and Economic Development has delegated to the Corporation all his rights, duties, powers, responsibilties and obligations under the Agreement, except as to his obligations to determine the Account Requirement in conjunction with the Corporation and to certify annually any deficiencies in the Insurance Account in respect thereof.

RATING

As noted on the cover page of this Official Statement, Standard & Poor's Corporation ("Standard & Poor's") has given the 1977 First Series Bonds a rating of . No application has been made to any other rating agency for the purpose of obtaining a rating on the 1977 First Series Bonds. Any explanation of the significance of such rating should be obtained from Standard & Poor's. The Corporation furnished to such rating agency information and materials relating to the 1977 First Series Bonds and itself, certain of which information and materials have not been included in this Official Statement. Generally, rating agencies base their ratings on the information and materials so furnished and on investigations, studies and assumptions by the rating agencies. There is no assurance that such rating will obtain for any given period of time or that it will not be lowered or withdrawn entirely if, in the judgment of Standard & Poor's, circumstances so warrant. The Underwriters have undertaken no responsibility either to bring to the attention of holders of 1977 First Series Bonds any proposed downward revision in such rating or to oppose any such proposed revision. Any such change in or withdrawal of such rating could have an adverse effect on the market price of the 1977 First Series Bonds.

TAX EXEMPTION

In the opinion of Bond Counsel, interest on the 1977 First Series Bonds is exempt from federal income taxes under existing statutes and court decisions, except that no opinion is expressed as to the exemption from such taxes of interest on any Bond during any period that such Bond is held by a person who within the meaning of Section 103(b)(7) of the Internal Revenue Code of 1954, as amended, is a "substantial user" of facilities with respect to which the proceeds of the Bonds were used or a "related person". Under the Act, the 1977 First Series Bonds and the interest thereon are exempt from taxation directly imposed thereon by the State of Alaska or any subdivision thereof, other than transfer, inheritance and estate taxes.

The Commissioner of Internal Revenue has proposed amendments to Section 1.103-1 of the Income Tax Regulations relating to interest paid on obligations of state and local governmental units. If adopted, these proposed amendments would impose substantial limitations on the type of issuer whose obligations would be deemed to have been issued "on behalf of" a state for purposes of the exemption from federal income tax afforded by Section 103 of the Code. If adopted in the form published, the proposed regulations would have no effect on the 1977 First Series Bonds, but might require an amendment to the Act in order to preserve the tax-exempt nature of interest paid on obligations issued after the effective date of such regulations. Failure of the Corporation to preserve the tax-exempt status of interest paid on future obligations could affect its ability to raise funds to pay outstanding bond anticipation notes at maturity.

LEGALITY FOR INVESTMENT

Subject to any applicable federal requirements or limitations, the 1977 First Series Bonds are eligible for investment by all public officers and public bodies of Alaska and its political subdivisions and, to the extent controlled by Alaska law, all insurance companies, trust companies,

Winchell/Phila. & NY—Contact I. Schlansky/C. Conrad (215) 568-1770 (Night) (215) 563-2628 (212) 422-2010
90027 Alaska Housing—Official Statement (10 Schoolbook x 38) 0—15
3rd Proof 2/25/77

Alaska HOUSING FINANCE CORPORATION

March 4, 1977

Honorable John Sackett, Chairman
Senate Finance Committee
Alaska State Legislature
Pouch V
Juneau, Alaska 99811

Honorable Jalmar M. Kerttula, Chairman
Senate State Affairs Committee
Alaska State Legislature
Pouch V
Juneau, Alaska 99811

Re: C.S. for House Bill 154 "An Act Making A Special Appropriation to the Mortgage Insurance Fund of the Alaska Housing Finance Corporation; providing for an effective date".

Dear Sirs:

With resp-ct to the above bill, understood to be referred to your respective committees, we enclose the draft of a proposed Official Statement of the Corporation relating to an issue of $25,000,000 Insured Mortgage Program Bonds, 1977 First Series presently scheduled for sale on March 31, 1977. The sale is necessary in this time frame to accommodate the expanded activity of the Corporation in the insured mortgage program field. For the last six months mortgage activity has increased to an average rate of approximately $8,000,000 in commitments each month. This level of commitments dictated financing of bonds in the amount of $45,000,000 as well as bond anticipation notes in the amount of $10,000,000. To date in 1977, the Corporation has issued $25,000,000 in bond anticipation notes in addition to the proposed $25,000,000 bond issue scheduled for March 31, 1977.

We feel that the expansion of the insured mortgage program of the Corporation is meeting an important public need in Alaska in making available mortgage loans at below market rates to lower and middle income borrowers and borrowers in rural areas.

As indicated by the draft Official Statement on pages 8 and 9, the proposed March 31 bond sale depends upon the enactment of C.S. for House Bill 154 on or prior to the sale date. Commissioner H. Phillip Hubbard, who is a member of the Board of Directors, has other data available which will support this legislation.

Telephone (907) 274-4621
Suite 100
Plaza 201 E. 3rd Avenue
P.O. Box 1020
Anchorage, Alaska 99510

I stand ready personally together with Commissioner Hubbard, Mr. Kent Dawson of the Governor's Budget Committee, Mr. Tolbert E. Elliott, Executive Director and our bond council, to meet with you in a committee session at anytime to answer questions.

I would appreciate it if you would make copies of this letter available to other members of the committee.

With thanks for your consideration, I am,

Very truly yours,

Richard T. Hall

Richard T. Hall
Chairman of the Board

RTH:whk

Enclosure

Alaska HOUSING FINANCE CORPORATION

P.O. Box 1020, Anchorage, Alaska 99510

TO: AHFC Board of Directors

DATE: January 25, 1977

FROM: Tolbert E. Elliott
Executive Director

The following excerpt is for your information:

Real Estate Services Corporation

Appraisers, Counselors, Investment Analysts

KENNETH JAY GAIN, M.A.I., S.R.P.A., C.R.E.C. — PRESIDENT
FRANKLIN M. KING, JR., M.A.I. — EXECUTIVE VICE-PRESIDENT
GARRETT W. WALDNER, R.M., S.R.A. — SECRETARY-TREASURER

STATEWIDE SERVICE

807 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
(907) 274-7636

1976 SURVEY OF THE
ANCHORAGE REAL ESTATE MARKET
AND ANCHORAGE REAL ESTATE BUSINESS

Confidence Rating of Agencies, Organizations, and Professions: In an effort to determine the confidence that local Realtors have in various agencies, organizations, and professions, we asked them to indicate their opinion of a number of these agencies, organizations, and professions by indicating a rating of 5 for very good, a rating of 4 for good, a rating of 3 for fair, a rating of 2 for poor, and a rating of 1 for very poor. This is a listing of the agencies in order of their confidence ratings for this year. The numerical rating figure and last years rank and numerical rating follow.

Order of Rank	Agency, Organization, or Profession	Numerical Rating	Last Year's Rating Order Of Rank	Last Year's Rating Numerical Rating
1	Alaska Housing Finance Corp.	4.06	2	3.61
2	Title Companies	3.61	1	3.89
3	Local Fee Appraisers	3.35	3	3.54
4	State Division of Veterans	3.15	7	2.93
5	Local Banks	3.08	5	3.10
6	Federal Veterans Admin.	2.92	8	2.89
7	Local Attorneys	2.90	6	3.03
8	Municipality of Anchorage	2.61	*	*
9	State of Alaska	2.60	9	2.77
10	Federal Housing Administration	2.45	11	2.29

* Last year the Municipality did not exist. In last year's study the City of Anchorage rated #4 with a rating of 3.35 and the Greater Anchorage Area Borough rated #10 with a rating of 2.29. Thus, the Municipality is rated poorer than the old City of Anchorage, but better than the old Borough.

RECORDS CERTIFICATION

I, the undersigned, an employee of the State of Alaska, do hereby certify that the microfilm images on this microform are accurate reproductions of the original records of the State of Alaska as accumulated during the regular course of business, and that it is the established policy and practice of this State to microfilm its records and to dispose of the original records after microfilm reproductions have been made.

James O. Smith
Signature of Camera Operator

2/14/90
Date

02-519 (REV 8/78)

April 22, 1977

Representative Steve Cowper
State of Alaska
Pouch V
Juneau, Alaska 99811

Dear Steve:

Mr. Bruce Boyd relayed your request for items significant in justifying House Bill No. 15 to operate a research facility for the study of surplus heat utilization at Fort Wainwright. The following points represent specific justifications for this appropriation:

1. At the present time, waste heat in the form of hot water from the steam operated electrical power plant at Fort Wainwright is dissipated in a cooling pond. This procedure adds water vapor to the atmosphere and generates substantial ice fog in the Fairbanks area during the cold winter months.

2. Consequently, the U.S. Army Cold Regions Research and Engineering Laboratory is currently constructing a system to dissipate the waste heat through pipes buried in the soil and for space heating in a greenhouse.

3. The U.S. Army is accomplishing the necessary engineering design and construction for this project, but does not intend to undertake the technological development necessary to utilize this system in the production of horticultural crops. Nevertheless, the system is ideally suited for this purpose.

4. The facilities would provide an excellent opportunity for the Alaska Agricultural Experiment Station to work cooperatively with this project in developing the necessary horticultural technology and application. HB 155 would provide an appropriation to the University of Alaska for the necessary personnel and materials to develop this technology and to provide a significant demonstration for the utilization of waste heat in other areas of Alaska. Without this appropriation the Agricultural Experiment Station will not have sufficient funds to accomplish the cooperative effort.

5. The horticultural industry in Alaska is particularly well adapted to utilize low grade waste heat in the +70°F to 80°F range that is available from power plants such as the plant at Fort Wainwright. Successful development of this technology would permit Alaska to produce high value, intensively cultured crops at world market prices and, more importantly, would provide these products for Alaskans.

6. If waste heat can be utilized in soil and greenhouse warming, Alaska will have a plant growth environment that is technically superior to areas at more southerly latitudes. The advantage is due to improved photosynthetic activity of leaves in sunlight and cool air conditions and the longer period of this advantage. The long day lengths from March 20 to September 20 and the better internal plant conditions for photosynthesis are advantages when low soil temperatures do not limit plant growth. Improved soil temperatures allow crops to take full advantage of long sunlight days, and and often higher yields are produced than in the best commercial production areas of the nation.

7. The U.S. Army has leveled the land adjacent to the power plant at Fort Wainwright, has added peat soil amendment to specifications supplied by the Agricultural Experiment Station, and is in the final stages of installing buried pipes to dissipate waste heat in experimental plots. In addition, plans are underway to construct greenhouse facilities heated by waste heat adjacent to the test plots according to technology transferred from greenhouse research at the Agricultural Experiment Station.

8. Specific tasks to be accomplished cooperatively by the Agricultural Experiment Station at these facilities if an appropriation is provided are as follows:

a. To determine proper crop varieties and productive capacity of vegetables under a system of near optimum soil temperature.

b. To determine the extension of growing season that can be achieved both in the greenhouse and out-of-doors using heated soil.

c. To determine the proper fertility and irrigation practices necessary for these systems.

d. To examine the possibility of growing commercial cut flowers such as roses, carnations and chrysanthemums using soil warming in a greenhouse environment.

e. To detect and correct any disease or insect problems that may develop under these growing systems.

9. Successful development of this technology will demonstrate an effective system for dissipating waste heat from power plants in a manner that will substantially reduce ice fog pollution, and will provide the technology necessary to expand the horticultural industry in Alaska through a system of energy conservation. This work is an essential step in developing energy conservation in Alaska.

Additional details of this research are available in a proposal provided to the House Resources Committee.

Sincerely,

James V. Drew
Director, Agricultural Experiment Station
Fairbanks, Alaska

(DRAFT)

Research Proposal

The Development of technology necessary to use "waste" heat for the enhancement of horticulture in Alaska and to reduce thermal pollution problems

University of Alaska
Agricultural Experiment Station
Fairbanks, Alaska 99701

D.H. Dinkel
Principal Investigator

Abstract

The purpose of this project is to develop the horticultural technology necessary to use the enormous quantities of excess heat that will be rejected in Alaska from power plants, refineries, pipeline pumping stations and geothermal sources. The use of waste heat for the production of horticultural crops in greenhouses and heated areas of soil outdoors is common to all wise proposals to completely utilize reject heat. The horticulture production part is necessary because the heat can be utilized during summer months and when less is required for space heating or other uses.

It is estimated that the quantity of excess heat that would be available from industry in Alaska could meet the heat energy requirements for hundreds of acres of high value vegetable and flower production.

In this project, both soil heating and "space" heating for greenhouses will be employed in conjunction with proven Northern Agricultural practice, with the dual purpose of improving agricultural production and reducing final output temperature and consequently thermal pollution from power plant cooling water.

The agricultural industry, and particularly the horticultural industry, is probably in the best position of many of the energy consuming activities to use low-grade heat from cooling waters discharged by industry. The Agricultural industry is also in the best position to utilize the high temperature excess heat from the pumping stations of the oil and gas pipelines.

Considering the magnitude and basic importance of agricultural production and the extent of its' energy use, a significant increase in efficiency of production would be obtained through the substitution of waste energy for nonrenewable resource-consuming energy. In addition, the increase in solar energy conversion to food and ornamental plants would be an important Alaskan and national gain.

The principle reason for agriculture's favorable position in Alaska is that growth rates are increased dramatically when soil temperatures are increased slightly or conventional greenhouses and temporary plastic canopies are used to improve air temperatures. These practices make possible in Alaska the use of solar energy that otherwise is not useable for food and other beneficial production. In some instances, lengthened growing seasons may permit additions of another crop, possibly doubling and tripling production of the land. Increasing Alaska's critically low soil temperature and using canopies and greenhouses creates a significantly better plant growth environment than found in most other areas of the U.S. because of the long sunlight days. This advantage should allow us to produce high value intensively cultured crops at world market prices, and more important provide these products to Alaskans.

Much of the basic information needed for the establishment of a horticultural industry using waste heat in Alaska is available in literature and from preliminary research in the state. What is most needed now is applications research, and the engineering and economic design required to demonstrate and incorporate what is known into development plans.

The proposed research will be done by the Agriculture Experiment Station, University of Alaska in cooperation with (CRREL) Cold Regions Research and Engineering Laboratory) and the U.S. Army.

The work will be done using existing greenhouse and crop facilities at the Fairbanks Agricultural Experiment Station and in facilities that are fortuitously being developed by the U.S. Army at Fort Wainwright to reduce thermal pollution and ice fog problems associated with the power generating facility.

The engineering and construction for much of this project is being done by the U.S. Army and Cold Regions Research and Engineering Laboratory (CRREL) at the Fort Wainwright South Power Plant. Heated "waste" water with temperatures of +70°F to +85°F in large quantities is available. Evaporation from the present large cooling ponds associated with this waste creates a severe ice fog problem in winter months. Efforts to reduce this thermal pollution problem are underway by dissipating the heat in soil by circulating the warm water through a buried grid of pipes. There would be a significant advantage to Alaska and the immediate community if these efforts could be used to conduct the developmental research necessary to demonstrate the use for the tremendous quantities of unused heat in the state.

Introduction

The primary energy source for modern agricultural food, fiber and ornamental production remains the sun; however, man has learned that he can increase productivity of his crops by modifying the plants' environment for maximum capture of sunlight. This environment modification is largely dependent upon the use of fossil fuels to supply the required technological materials such as machinery, plastics, pesticides and petroleum for heating, farming, drying, processing and transportation.

Much of the energy required to produce intensively cultured crops in Alaska is in the form of heat requirements. This energy is needed to heat greenhouses and warm soils. If these heat requirements are supplied in Alaska we then have a plant growth environment that is technically superior which should create an economic advantage even in regards to competing on world markets for commodities that can be shipped. The advantage is due to the improved photosynthetic activity of leaves in sunlight and cool air conditions (10), and the longer period of this advantage. An analysis of Alaska's climate shows that during a similar calendar period corresponding to May through mid-September, there are 430 to 550 more hours of sunshine in Alaska than there are at latitudes similar to Minneapolis, Minnesota and Chicago, Illinois. The advantage

of this extra sunshine for rapid growth of adapted crops has been amply demonstrated by the production of the well-known 70-lb Alaskan cabbage and by numerous research studies in Alaska (7). Thus, the longer period of sunlight from March 20 to September 20 and the better internal plant condition for photosynthesis are advantages to growth if soil temperature or other factor does not limit the activity.

It has been demonstrated that one of the most critical environmental factors that limits the growth of many crops in Alaska is the soil temperature (4,5,6,7). Soil temperatures that seldom rise above 13-18°C. at the 10 cm. soil depth during the growing season impede seed germination and severely limit the growth of certain economic plants. The optimum soil temperatures for most cultivated crops ranges from between 21 and 30°C. Increased soil temperatures resulting from the use of clear polyethylene on the soil, electric heating cables and buried styrofoam give greatly increased growth of crops and earlier maturation (7). Clear polyethylene mulches cause soil heating by solar radiation because of the entrapped layer of still air, reduced moisture evaporation and the lower transmission by polyethylene of the heat radiation from soil as compared to the high transmission of incoming solar radiation. The improved soil temperatures allow the crops to take full advantage of the long sunlight days, and often higher yields are measured than those produced in the best commercial production areas of the nation.

Research in climates such as Minnesota show that soil warming by waste heat does provide some improved growth rate and some extension of the growing season (1,2). Due to normally warm soils during mid-summer in Minnesota that are near optimum for plant growth, waste energy can only be used during the spring and again in the fall. Alaska, with the much colder soils throughout the year and the greater sunlight during the growing season, offers greater advantages for waste heat utilization for the production of high value crops.

The feasibility for the use of low temperature waste heat for heating of greenhouses has been reported (3, 10, 11). A large greenhouse industry has developed in Iceland using warm water from geothermally heated springs for heating. A viable seasonal greenhouse industry has developed in Alaska using fossil fuels for a heat source. There is a significant need to expand this industry utilizing waste heat from industrial and geothermal sources. The rising cost and scarcity of fossil fuels to heat greenhouse units is a major threat to the stability and continuance of the nation's greenhouse vegetable and ornamental units. These factors appear to be blocking expansion and may actually terminate the greenhouse industry in areas where alternative methods of heating cannot be found.

Energy from industrial sources, usually in the form of hot water at temperatures from 21 to 70°C, is normally wasted by discharging it into the air or into bodies of water. These point sources of unused heat represent a poor stewardship of our resources and cause an environmental impact of considerable concern. A systematic approach to the utilization of unused heat suggest its' use in district heating of

houses, businesses and greenhouses, and in warming field soils for crop production.

Extent of unused heat: The efficiency of modern fossil fueled electrical generator plants is approximately 40%, while that of nuclear plants ranges between 30 and 33%. Thus, of the total energy available from the original fuel source slightly over one-third is presently used. The remaining two-thirds is rejected by being discharged into the environment. About 85 percent of the rejected heat is discharged into water bodies and 15 percent is discharged into the environment through the stack. Enormous quantities of very high temperature steam will be exhausted from the Energy Resources of Alaska refinery at North Pole, Alaska. Each pumping station along the trans-Alaska oil pipeline will exhaust large quantities of heat. It has been estimated that the 12 pumping station and liquefaction plant for a trans-Alaska gas line may exhaust approximately 36 million BTUs per second.

Facilities:

The Agricultural Experiment Station 40' x 90' existing greenhouse with attached head house will be used to produce test plants and for initiating the greenhouse work. One 30' x 40' section of the greenhouse will be slightly modified to simulate conditions that will be associated with a source of hot water.

The major plot work will be done at Fort Wainwright near the Power plant cooling pond. The U.S. Army and CRREL are concerned about the vapor pollution problems associated with the cooling pond and about the thermal waste. They have agreed to support a joint effort to the extent that they will provide engineering and most of the construction for the study site. The Agricultural Experiment Station wishes to cooperate by supplying the horticultural research effort.

CRREL has leveled the land adjacent to the site, added peat soil amendment to our specifications and are presently in the final stages of installing the distribution system and the piping to heat some test plots. There presently are 3 test plots 50' x 150' that will be heated with adjacent control plots. CRREL presently has plans to construct greenhouse facilities adjacent to these test plots to transfer the technology from the Agricultural Experiment Station greenhouse to an operational system.

Tasks:

To determine proper crop varieties and productive capacity of vegetables under the proposed system of near optimum soil temperature.

To determine the amount of season extension that can be achieved both in the greenhouse and out of doors using soil heating with and without plastic canopies.

To determine the proper fertility and irrigation practices necessary for this type of system.

To examine the possibility of growing commercial cut flowers such as roses, carnations and chrysanthemums by using a system that has heat provided in the soil and that would grow for 9 months and during the dark months of November, December and January would be held at a storage temperature of approximately 35°F. During the dark period the greenhouse would be modified with heat saving shields similar to those used in Europe so that heat loss could be reduced.

To determine if unusual disease and insect problems may develop as a result of the warmer environment.

Additional Project Objectives:

Concurrent with the horticultural objectives, data will be produced that will be useful for improving the collection and distribution system for waste energy in northern conditions.

Information will be gathered on thermal and vapor pollution abatement.

Personnel:

The Principle Investigator and leader for the Agricultural Experiment Station effort will be Dr. Donald H. Dinkel, Professor of Plant Physiology. The legislation is largely to provide research assistance to Dr. Dinkel.

The Principle Investigator and leader of the CRREL effort will be Dr. Terry McFadden.

Title:

The Feasibility of Utilizing Waste Heat from the Trans-Alaska Pipeline for Grain and Forage Drying

Principal Investigators:

Frank J. Wooding, Ph.D.
Associate Professor of
Agronomy

Carol E. Lewis, Ph.D.
Assistant Professor of
Resource Systems

Performing Organization and Address:

Agricultural Experiment Station
School of Agriculture and Land Resources Management
University of Alaska
Fairbanks, Alaska

Date:

February 9, 1977

THE FEASIBILITY OF UTILIZING WASTE HEAT FROM THE TRANS-ALASKA PIPELINE FOR GRAIN AND FORAGE DRYING

BACKGROUND

Much emphasis has been placed in recent years on energy utilization and it's impact on economic growth. In the face of an increasing world population, heavy demands are being made on energy supply sources, particularly as related to food production. It has become exceedingly important to conserve and improve the efficiency of energy available from both fossil and non-fossil fuels. This is very evident in the agricultural industry, particularly in small grain and forage production. As an example, natural gas forms the energy base for over 80 percent of the energy used in irrigation pumps, grain drying and anhydrous ammonia fertilizer production in Kansas. Decreasing supplies of natural gas can be expected with continuously rising prices.(1) This will be true in all agricultural areas of the United States. It is important to utilize the maximum energy available from any fuel source.

Alaska, in particular, is placed in a unique position in the scenario of total energy use in food production. Over 17 million acres of tillable land and 10 million acres of rangeland have been identified.(2) One area, the Delta-Clearwater region, in the interior is considered most attractive for future agricultural development for the following three major reasons:

1. The area contains approximately 10,000 cleared acres and over 100,000 acres of uncleared land with high agricultural potential. Portions of this acreage are currently in use for the production of grain and forage crops.

2. Pump Station #9 of the trans-Alaska pipeline is located centrally within the area. During beginning phases of oil flow, an average of 800,000 BTU per minute of low pressure turbine exhaust will be released at temperatures of 475° F at an ambient temperature of 0° F. At maximum oil flow, this will increase to an average of 1,000,000 BTU per minute at temperatures of 535° F.(3) These temperatures are considered within the range necessary to operate grain and forage dryers, which have an energy requirement in the neighborhood of 1/10 that available from Pump Station #9, if the grain and forage is harvested at moisture levels as high as 40 to 60 percent.(4,5)

3. The beginnings of a production and marketing infrastructure are present in the Delta-Clearwater area. A major road system serves as a connector to Fairbanks and Anchorage. Farm equipment and supply outlets are located within a 100 mile radius. Small grains and hay produced within the area are marketed within the state through established channels. In addition, Delta Junction is the headquarters of the Alaska Farmers Cooperative, Inc..

The potential for growth in agricultural production, processing and marketing in the Delta-Clearwater area will not be realized until several specific questions are resolved. These are:

1. Can waste heat be used for grain and forage drying? Although the heat generated by pump station turbine exhausts is extremely high, it is not in a form immediately usable in any agricultural application. Investigations show that systems can be designed within specifications of the turbines to use the heat generated.(6) The various methods of transfering the heat to the drying area must be investigated to determine that which is the most efficient. Use of waste heat for grain and forage drying may make production of these crops within Alaska economically attractive.

2. Will use of turbine exhaust gases for drying damage grains and forages? Indications are that there will be no damage and that there may be an advantage to using waste gases. Grains and forages should be analyzed both before and after a storage period to determine the effect of the exhaust gases, if any.

3. Will grains and forages produced meet international quality standards? Data from the Agricultural Experiment Station at Fairbanks indicate approximately 80 percent of barley produced in the Delta-Clearwater area can meet international standards. Again, analysis of grain and forage quality before and after a storage period will substantiate this data.

The conversion and use of gas turbine exhausts as an energy source for drying grains and forages is a key to large scale production of an animal feed product within Alaska.

PROJECT OBJECTIVES

The objective of this project is to show the feasibility for utilizing waste heat for drying grains and forages. This will accomplish:

1. The provision of a waste heat recovery system design for Pump Station #9 of the trans-Alaska pipeline or for similarly designed exhausting systems.

2. The provision of a method for more efficient use of fossil fuel in a multi-purpose system (pump station operation and crop drying).

3. A means to use high moisture grains and forages as a year-round feed base in Alaska and as a marketable product to areas outside the state.

All of the above will combine to provide the opportunity for growth of an agricultural industry which will include as major components production, processing and marketing of grains and forages. The industry will serve the immediate area and the state and provide consumer benefits including dollar savings per unit of energy expended.

PROJECT AREA

The Delta-Clearwater area is largely agricultural. It is serviced by a major highway system providing access to Fairbanks (90 miles west-northwest), Anchorage (300 miles southwest) and the Canadian border (200 miles southeast). The nearest railhead is in Fairbanks; the nearest port, Anchorage. Only charter airlines service the area with Fairbanks the nearest international airport. The area cannot be considered a bedroom community of fairbanks, although Fairbanks is considered the primary trade center. It was, previous to the trans-Alaska pipeline influx, a trading center for area farmers, most of whom had begun as homesteaders. In fact, Fairbanks, ninety miles west of the Delta-Clearwater area, from the turn of the century to the 1930's, was considered the center of Alaska's agriculture. Cattle and hogs were rainsed. Market vegetable production, hay production and grain production were under way.

In 1968, legislative action made additional land available to persons actively engaged in farming. Several area farms have grown because of this action but have not expanded substantially. As examples, a 1,000 hog production facility was established in 1970, but did not remain in operation because of lack of a consistent feed supply and lack of an existing market infrastructure.(7) A dairy operation involving more than one hundred head with a complete processing, packing and distributing facility exists in the area. In addition, a beef cattle feeding operation involving one hundred head was recently established. There is an on-going egg production operation of over 10,000 laying hens, as well as a sheepherder with a one hundred head flock. Agriculture in the area is not limited by climactic or biological factors, but by factors of a developmental and economic nature.

The transportation access in the Delta-Clearwater area provides a means for import and export of products. The same system makes distribution to inter and intra-state destinations possible, and provides access to shipping ports making available possibilities for international trade. Japan, in particular, imports 90 percent of its vital grains. Alaska, with a high quality grain product, could be in a good position to compete in the international livestock feed market. As the market is expanded, the Delta-Clearwater area could conceivably provide up to 100,000 acres of high quality agricultural land for production of grains and forages.

An ad hoc committee on agriculture has prepared an assessment of large scale barley production in the Delta-Clearwater area. The assessment indicates that farms approximately 3,000 acres in size, using fallow management systems are viable and that sufficient quantities of grain can be produced on 50,000 acres to warrent a 1 million bushel put-through elevator-dryer system.(9) Investigation of the potential of drying grains and forages with waste heat is, therefore, of high interest in terms of contribution to a renewable resource economic base for the state. The conclusion which may be reached is that waste heat utilization may well be the impetus needed for the revival and future development of agriculture in Alaska.

RELATED STUDIES AND PROJECTS

The following is a listing of projects, with references, of on-going and future research by the University of Alaska, Agricultural Experiment Station.

Grain and forage production:
For the past four years, a cereal grain research program has been conducted in the Clearwater-Big Delta region. Emphasis has been placed on evaluation of barley, oat and wheat varieties as feed grain crops. Oat varieties have also been evaluated as a forage and straw crop. Other areas of research include fertilizer response, comparison of production systems (continuous grain vs. summer fallow-grain), tillage practices, seeding rates, and weed control.

Burton, W. E., D. H. Dinkel, and F. J. Wooding, "So Many Questions-So Few Answers", Agroborealis, Vol. 3, No. 1, pp. 21-24, 1971.

Wooding, F. J., G. M. Paulsen, and L. S. Murphy, "Sulfer Composition of Soybeans as Affected by Macronutrient Deficiencies", Soil Science and Plant Analysis, 3:151-159, 1972.

Wooding, F. J. and C. W. Knight, "High Protein Grain from Interior Alaska", Agroborealis, Vol. 4, No. 1, pp. 12-13, 1972.

Martin, G. C., R. F. Barnes, A. B. Simons, and F. J. Wooding, "Alkaloids and Palatability of Phalaris arundinancea L. Grown in Diverse Environments", Agronomy Journal, 65:199-201., 1973.

Wooding, F. J. and A. C. Epps, "Grain Varieties for the Golden Valley", Cooperative Extension Service Publication No. 46, University of Alaska, 1973.

Wooding, F. J. and C. W. Knight, "Barley Yields on Summer Fallowed and Stubble Land", Agroborealis, Vol. 5, No. 1, p. 22, 1973.

Wooding, F. J., D. H. Hassinger, and G. Willis, "Grains in Seward's Icebox", Agroborealis, Vol. 6, No. 1, pp. 4-6, 1974.

Wooding, F. J., J. L. Brossia, S. D. Sparrow and D. H. Hassinger, "Small Grains on Agricultural Land in Remote Areas of Alaska", Agroborealis, Vol. 7, No. 1, pp. 28-30, 1975.

On-going research concerns grain production in the Tanana Valley of interior Alaska. The objectives are to increase production of barley, oats, and wheat through a broad, intergrated, research program of variety testing and cultural practices. Triticale is to be evaluated as a potential new grain crop. Grains produced in a subarctic environment are to be evaluated for quality and suitability. In addition, grain adaptation tests are being conducted for remote areas of Alaska.

Wooding, F. J., "Small Grain Production in the Tanana Valley of Interior Alaska", Hatch Project, March 1, 1974.

Wooding, F. J., "Grain Adaptation Tests for Remote Areas of Alaska", Special Appropriation of Hatch Funds, 1974.

Since May, 1970, research on peas, barley and oat mixtures has been conducted to determine in-combination and independent response to harvest date and crop mix. The parameters of interest are protein, digestibility and yield.

Brundage, A. L., R. L. Taylor and V. L. Burton, "Barley, Oats and Peas, Alone and in Combination, for Forage", presentation at the Annual Meeting of the American Dairy Science Association, June, 1976.

Markets:

Past work on markets for agricultural commodities produced in Alaska has been largely confined to only statewide markets. The topics covered have included pork, beef, vegetables, dairy, and feed production. Although only limited local markets were identified, production within the state is small enough to allow market expansion in most areas.

Burton, W. E., "Alaska's Agriculture", Institute of Social, Economic and Government Research, University of Alaska, 1971.

Flynn, E. and W. Thomas, "Assessment of Markets for Fresh Vegetables in Anchorage", G. E. - TEMPO, Research Publication, 1973.

Thomas, W., and P. Linn, "Economic Factors in Alaskan Milk Marketing", Agroborealis, 1972.

Stephens, C., W. Thomas and V. Burke, "Supplying Alaska's Red Meat and Poultry Products, Institute of Agricultural Sciences, University of Alaska, 1975.

Research just beginning at the University of Alaska will analyze the export market for feed barley, malt barley, and grain and/or feed pellets. Identification will be made of possible markets and problems and opportunities associated with these markets. Included will be an analysis of price conditions, trade arrangements, transportation system requirements and appropriate domestic and foreign government regulations.

Thomas, W., "Agriculture in Alaska; 1976 - 2000 A.D.", Alaska Review of Business and Economic Conditions, Institute of Social, Economic and Government Research, University of Alaska, June, 1976.

Thomas, W., "International Markets and Marketing for Alaska Produced Farm Products", Research Project, Agricultural Experiment Station, University of Alaska, 1976. Sections of this marketing research will be carried on as in-kind contributions to the waste energy project proposed here.

Agricultural potential:
There are three agricultural potential studies which are on-going within the Agricultural Experiment Station. The major concern is economic and social impact on the state and on available markets for products from the state.

Buton, W. E., "Creating a Northern Agriculture, I, II, III, IV, V", University of Alaska, Agricultural Experiment Station Bulletin No. 42 through 46, 1975, 1976.

Faris, J. E. and R. J. Hildreth, "Consideration for Development - Alaska's Agricultural Potential", for the Federal Land Use Planning Commission of the University of Alaska, Agricultural Experiment Station, April, 1976.

Thomas, W. C., C. E. Lewis and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

Waste heat utilization:
The utilization of waste heat in agricultural systems has been addressed within the Agricultural Experiment Station.

Dinkel, D. H., "Potential for Production of Intensively Cultured Crops in Alaska Using Geothermal or Waste Heat Sources", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak., Aug. 13, 1976.

Lewis, C. E., "The Utilization of Waste Heat in Agribusiness Development ", presented at the Second Int. Symp. on Cold Regions Engineering, Univ. of Ak. Aug. 13, 1976.

PROJECT PROCEDURES

Method of Approach

A three part study will be conducted over a two year period to provide answers to those questions raised in the background discussion. The parts of this study are:

Part 1. Provision of an efficient design for the conversion of low pressure turbine exhaust to usable form.

Part 2. Determination of the effect of turbine exhaust gases on quality of grains and forages.

Part 3. Determination of grain and forage quality after drying with exhaust gas and after a period of storage at varying moisture levels.

Discussion of Part 1.

The exhausted heat available is in the form of a low pressure, high BTU per minute flow at high temperatures. Requirements of low back pressure for efficient turbine operation limit the design specifications for recovery of the heat. Both a fin tube and a tube/ambient air system have been suggested. Alternate possibilities will be considered. The possibility of a water jacket surrounding the recovery tube will be investigated, assuming a future need for heated water. Cost of the system and operation and maintenance requirements will be a primary consideration.

CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

Thomas, W. C., C. E. Lewis and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

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In FY 78, a small dryer (200 bushel per hour) will be purchased and equipped with heat conversion and transport systems which will allow utilization of turbine exhausts. If it is not possible, due to conflict with pipeline start-up operations, to use the Pump Station #9 site, an alternative source will be used. Several are available in the Fairbanks area. The dryer system is scheduled to be operational in FY 79.

After completion of drying of the FY 79 crops, an analysis of operating efficiency, cost of operation and conversion and installation costs will be prepared. The waste heat system will be compared to conventional drying systems using this cost data.

Discussion of Part 2.

During FY 78, grain and forage samples harvested either in Fairbanks or in the Delta-Clearwater area will be dried to moisture levels varying from 30 to 12 percent. The drying will be done at the Agricultural Experiment Station at Fairbanks using conventional drying methods. The objective of the FY 78 sampling is to establish a data base for Alaskan grains and forages dried using conventional methods. This data base will be used as a comparison when turbine exhaust is used for drying.

Before storage, contractural services will be used to analyze grain and forage quality. Particular attention will be given to carbohydrate content (sugars and starches), protein content, and amino acid composition of proteins.

The grain and forage samples will be stored in outdoor bins. After a nine month storage period, an analysis will again be conducted of carbohydrate content and proteins. Additionally, a determination will be made of the type and amount of fungal organisms and amounts or presence of micro-toxins in the stored grains and forages.

Discussion of Part 3.

During FY 79, the grain and forage drying procedure of Part 2. will be repeated. However, the drying will be accomplished using a waste heat source and a drying system described in Part 1.. Contractural services will again be used to perform the analysis described in Part 2. on the dried samples and on samples taken from grains and forages which have been stored for nine months.

After sample analysis is completed, carbohydrate content, protein levels, amino acid composition of proteins, and fungal types and micro-toxins present will be compared to those in the grain and forage samples in the control group of Part 2..

Summary of Data to be Collected

After completion of the three part study (July 1, 1979), sufficient data will have been collected to complete a report addressing the questions:

1. Can waste heat be used to dry grains and forages?
2. Will use of gas turbine exhaust for drying effect grains and forages?
3. Will grains and forages produced in Alaska meet internation quality standards both before and after storage?

The following data catagories will be used in the report.

1. Technology of waste heat recovery systems for use in grain drying.
2. Efficiency of waste heat recovery systems considering all energy uses within a system. An example would be the use of fossil fuel for pump station operation and a use of the exhaust heat from the turbines for crop drying.
3. Investment cost of the waste heat recovery system.
4. Operating cost of the recovery system.
5. Efficiency, investment cost and operating cost of conventional drying systems.
6. Quality characteristics of grains and forages stored at varying moisture contents for one season after drying by either conventional or waste heat methods.
7. Quality characteristics of grains and forages immediately after drying either by conventional or waste heat methods.

FOLLOW-UP

This project has been proposed to aid those persons already producing grains and forages within Alaska and those who may be considering a beginning enterprise. At present, there is no data base which the farmer can use to determine to what moisture level grains and forages should be dried to maintain quality after storage under interior Alaska climactic conditions. Moreover, much interest has been generated concerning the use of waste heat for grain and forage drying. It is

reasonable to assume an operating cost savings would be effected by waste heat utilization. When the cost of wasted energy is compared to investment cost of recovery systems, the qualitative savings of valuable fuels is also large. Cost savings may be even larger if the use of turbine exhaust proves beneficial in storage of grains and forages at higher than normal moisture levels. However, if gas turbine exhausts damage the crop, there will be no need for further consideration of waste heat for grain and forage drying. The completion of the much needed data base for drying of grains and forages utilizing waste heat.

FOOTNOTES

1. R. J. Robel, "There May be Energy Tomorrow but at a Frightful Cost", address to the Kansas Cooperative Council, 1976.

2. Alaska Rural Development Council, "Alaska's Agricultural Potential", prepared by the Agricultural Potential Committee ARDC Pub. No. 1, Fairbanks, Alaska, March, 1974.

3. Communication: Alyeska Pipeline Service Company, Anchorage, Alaska, April 28, 1976.

4. Operating and Parts List, Behlen Model K Grain Dryer, Behlen Manufacturing Company, Columbus, Nebreska.

5. Correspondence: MEC Company, Neodesha, Kansas, 1976.

6. Communication: Ekodyne, Inc., Santa Barbara, California, April 16, 1976.

7. Communication: F. J. Wooding, May, 1976.

8. A. Tussing, et. al., "Alaska Pipeline Report", Institute of Social Economic and Government Research, Univ. of Ak., Sept., 1971.

9. Thomas, W. C., C. E. Lewis, and F. J. Wooding, "The Potential for Production of Barley in the Delta-Clearwater Area of Interior Alaska", Univ. of Ak., Ag. Exp. Station, February, 1977, draft.

Pertinent Questions and Answers on Subject of Waste Heat

By
D. H. Dinkel

Q. What is waste heat?

A. Waste heat is the term commonly used for energy that is rejected from various industrial sources. It usually results from the burning or other consumption of fossil fuels; however, it may also result from nuclear power plants or represent the unused heat from geothermal sources. The waste heat rejected from a process using fossil fuel usually exceeds the amount of the energy that is put to useful work such as the production of electricity. For example, most electrical power generation facilities that operate with fossil fuels have only a 30 per cent efficiency and the remainder is rejected as hot water or hot air.

Q. What is the extent of unused heat in Alaska?

A. The quantity is enormous at the present time and it will increase greatly as the pipelines, refinery and other power plants are placed into operation. It is estimated that each pumping station along the Trans-Alaska Pipeline could heat 2000 homes. The estimate for the North Pole Petroleum refinery is that 10,000 homes could be heated. Canadian sources estimate that each pumping station associated with their Mackenzie Valley Pipeline will produce enough clean waste heat to meet the requirements for 15 to 20 acres of greenhouse vegetable production. However, there has not been an inventory made of the present and future status of the waste heat that will be rejected and that could be used in the state.

Q. What are some proposed uses?

A. Agriculture, fisheries and aquaculture, forestry, processing and district heating in commercial and domestic areas. High temperature waste heat also may be useful in some cases for the generation of electricity where uses can be found for the remaining lower temperature heat so that vapor and thermal pollution is not a problem. For example, it would be technically possible to generate electricity from the high temperature waste from the North Pole Petroleum refinery. However, if this is done the reject energy would be in a form that could not be injected into the upper atmosphere and would create a vapor or ice fog problem during winter months. Agriculture and district heating could provide a use for this remaining low temperature reject energy.

Agriculture

The high temperature reject heat could be useful for forage and grain drying and may provide the necessary component that would make potato processing feasible in the state and therefore, expand potato production.

Heat energy consisting of hot air, hot water or steam and at temperatures ranging from 80°F to 800°F would be useful for greenhouse

production and vegetable and plant production in areas that would support horticulture crop production resulting from soil warming. The use of the heat in greenhouses and then during the summer months in the soil for crop production is necessary to all wise proposals that suggest a near total use for the energy. This crop use is probably necessary because it can utilize the low temperature energy and would utilize the heat as less is needed for other uses. It appears to be an important part of every systems approach to utilizing this resource because the near total use of the resource will make the collection and distribution more economical for each use.

Aquaculture, Forestry Processing and District Heating

The use of heat to improve production of fisheries through hatchery rearing and in fish production ponds is suggested. The heat requirement for forestry, processing industries and in district heating of homes and businesses is obvious if the heat can be collected and distributed. The more complete use that would result by greenhouse and soil heat use would provide a better economic picture for the above uses.

Q. Is our environment suitable for the types of intensive crop production that is suggested?

A. During the four summer months it is superior to most other areas of the nation. The northern latitudes are recognized to have the highest photosynthetic production rate in the world during these four summer months. If the season can be lengthened and/or the soil warmed, the productive capacity can be further increased, and this photosynthetic advantage further exploited.

Q. Why hasn't the greenhouse industry developed without the waste heat use?

A. It is one of Alaska's major agricultural industries at the present time, but it has been developed through the use of fossil fuels which are even higher in cost than they are in the rest of the nation.

Q. There are indications that hundreds of acres of greenhouse and soil heated vegetable production is possible. Could all of these products be marketed in Alaska?

A. No. Besides providing Alaskans with vegetables and ornamental plants, it would be necessary to market cut flowers such as roses, carnations, chrysanthemums and etc. on national and world markets. It is proposed that this could be done competively during 5-6 months of the year because of Alaska's superior environment for greenhouse production and through the use of waste energy.

Q. Why do you feel that it is important to examine national and world markets for cutflowers?

A. Because it appears to be necessary at the present time in order to make more complete use of our unused resource. It also would add to the stability of our economy to have a renewable resource such as this contributing to the state's economy. It would also decrease the nation's consumption of fossil fuels now used for this purpose in the present greenhouse growing areas.

Q. What will be the temperature of the Waste Heat?

A. The temperature of the reject heat energy will vary with the type of industry and will range from about 80°F to above 800°F. It will be exhausted as hot air, hot water or steam.

It is expected that not all reject energy could be utilized at this time because of accessibility problems, the lack of adjacent growing areas and the lack of technology. A systems approach with agriculture as a major user appears to give the best potential.

Q. What is the urgency in the legislation now in process?

A. We must promote the use or it will not happen. The potential for use must be designed into the system in the beginning in order to develop the most economical recovery system. For example the oil pipeline pumping stations were not designed with reject heat use in mind, and, therefore, it will cost more to recover the heat.

Although the technology appears to be available at the present time to make economical use of the energy, it is necessary to demonstrate this and to improve this technology.

SSHB 155

STATE OF ALASKA
THE LEGISLATURE

LEGISLATIVE AFFAIRS AGENCY

POUCH Y - STATE CAPITOL
JUNEAU, ALASKA 99811
907-465-3800

MEMORANDUM

February 3, 1977

SUBJECT: Fiscal Note for Sponsor Substitute for Senate Bill 13

TO: The Honorable J. Kerttula

FROM: Deborah Behr (DB)
Research Analyst

Attached please find the fiscal note you requested on the special appropriation to the University of Alaska for a study of surplus heat utilization. The fiscal note was prepared by Dr. Donald Dinkel, professor of plant physiology for the University of Alaska.

I hope this answers your request. If you require additional details on this topic, please do not hesitate to contact me at 465-4917.

DB:jm
Attachment

SSHB 155

THE LEGISLATURE OF THE STATE OF ALASKA
TENTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. Sponsor Substitute for Senate Bill No. 13
Title "An Act Making a Special Appropriation To University of Alaska ...for the study of ~~XXXXXXXXXX~~ Surplus Heat Utilization..." Date January 26, 1977
REQUESTED BY Senator Kerttula

II. FISCAL DETAIL
Agency Affected University of Alaska
Program Category Affected Education
Budget Request Unit(s) Affected Agricultural Experiment Station/Organized Research

EXPENDITURES (Thousands of Dollars)

		FY 77	FY 78	FY 79	FY 80	FY 81	FY 82
100	PERSONAL SERVICES	4.2	40.7	43.9	-0-	-0-	-0-
200	TRAVEL	-0-	2.3	-0-	-0-	-0-	-0-
300	CONTRACTUAL	-0-	1.7	-0-	-0-	-0-	-0-
400	COMMODITIES	-0-	5.5	2.5	-0-	-0-	-0-
500	EQUIPMENT	-0-	0.5	-0-	-0-	-0-	-0-
600	LAND & STRUCTURES	-0-	-0-	-0-	-0-	-0-	-0-
700	GRANTS, CLAIMS, ETC.	-0-	-0-	-0-	-0-	-0-	-0-
	TOTAL	4.2	50.7	46.4	-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND	4.2	50.7	46.4	-0-	-0-	-0-
FEDERAL FUNDS	-0-	-0-	-0-	-0-	-0-	-0-
OTHER (Specify)	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS

FULL TIME	1	1	1	-0-	-0-	-0-
PART TIME	-0-	-0-	1	-0-	-0-	-0-
TEMPORARY	1	1	1	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III)

See Attachment

IV. DATE January 27, 1977 PREPARED BY Dr. Donald H. Dinkel, Professor of Plant
AGENCY Physiology, Agricultural Experiment Station
PHONE 479-7652 University of Alaska

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named)

33 001 (Rev. 10/76)

Sponsor Substitute for
Senate Bill No. 13
Project Summary Totals

100	Personal Services		$ 88,716.84
	FY 77	$ 4,209.97	
	FY 78	$40,655.95	
	FY 79	$43,850.92	
200	Travel		$ 2,350.00
	FY 77	$ 0	
	FY 78	$ 2,350.00	
	FY 79	$ 0	
300	Contractural Services		$ 1,700.00
	FY 77	$ 0	
	FY 78	$ 1,700.00	
	FY 79	$ 0	
400	Commodities		$ 8,040.00
	FY 77	$ 0	
	FY 78	$ 5,540.00	
	FY 79	$ 2,500.00	
500	Equipment		$ 500.00
	FY 77	$ 0	
	FY 78	$ 500.00	
	FY 79	$ 0	
		TOTAL	$ 101,306.84

IV

Or

cc:

Sponsor Substitute for
Senate Bill No. 13
Analysis of Fiscal Note

FY 77 Costs

100 Personal Services $4,209.97

Senior Research Assistant (21A) $2,635.57

This position would be employed for one month prior to FY 78 to begin implementation of the research project. The Senior Research Assistant would be a specialist in horticulture technology and would be responsible for data analysis, background preparation, and other duties as assigned by the project head.

$1,895.00	Salary ($1,895.00 per month x 1 month)
301.31	Leave Allowance (15.9%)
$2,196.31	Subtotal
439.26	Staff Benefits (20%)
$2,635.57	Position Total

Horticulture Trainee (11A) (Temporary Help) $1,574.40

This position would be employed for one month prior to FY 78 to perform gardening functions and other tasks. This position would weed, care for harvest, weigh the garden products, and perform other labor duties.

$1,312.00	Salary ($1,312.00 x 1 month)
262.40	Staff Benefits (20%)
$1,574.40	Position Total

TOTAL FY 77 COSTS $4,209.97

Sponsor Substitute for
Senate Bill No. 13

FY 78 Costs

100 Personal Services $40,655.95

Senior Research Assistant (21A) $31,209.55

This position would be needed for 12 months to develop the project. The person employed would be a horticulture specialist who would care for plants, calculate data documenting project accomplishments, and do other duties as assigned by the project head.

$22,440.00	Salary ($2,040.00 per month x 11 months)
3,567.96	Leave Allowance (15.9%)
$26,007.96	Subtotal
5,201.59	Staff Benefits (20%)
$31,209.55	Position Total

Horticulture Trainee (11A) $ 9,446.40
(Temporary Help)

This position would be responsible for performance of horticulture labor functions related to the project. The person would do maintenance duties of weeding, caring for plants, etc.

$7,872.00	Salary ($1,312.00 per month x 6 months)
1,574.40	Staff Benefits (20%)
$9,446.40	Position Total

200 Travel $ 2,350.00

Travel required to review waste heat agriculture projects in parts of United States, such as Minnesota, Oregon, Idaho, etc., to analyze various techniques for application in Alaska. $ 850.00

Iceland is one of the major countries that currently employes waste heat for industry uses. A review of its techniques would be done to examine for methods useable in Alaskan environment. $ 1,200.00

Three trips to and from Palmer would be necessary to build greenhouse facilities. Transportation to install equipment and appliances would be required. $ 300.00

300 Contractual Services — $ 1,700.00

Photography services will be required to record results of study. Computer services will be needed to calculate and analyze data produced.	$ 500.00
Publication of study to report findings of the projects. Printing and mailing costs are included in the figure.	$ 1,200.00

400 Commodities — $ 5,540.00

Supplies necessary for waste heat research

a) Thermo Couple Wire	$ 175.00
b) Stakes, Tags, Bags Containers	200.00
c) Fertilizers and Growth Media	800.00
d) Shade Cloths and Alterations to Attach to This	725.00
e) Plants and Shipping	2,500.00
f) Special Tubing	250.00
g) Pots	325.00
h) Vexar Netting	145.00
i) Special Tools (Knives, pruning shears)	75.00
j) Insecticides	70.00
k) Connections for Steaming Soil	275.00
	$ 5,540.00

500 Equipment — $ 500.00

Special pumps and fertilizer injector are necessary for project.

FY 78 TOTAL $50,745.95

Sponsor Substitute for
Senate Bill No. 13

FY 79 Costs

100 Personal Services — $43,850.92

Senior Research Assistant (21B) — $32,942.90

This position would be responsible for maintenance and completion of the project. The person would also prepare documentation for publication on the results.

$23,298.00	Salary ($2,118.00 per month x 11 months)
3,704.38	Leave Allowance (15.9%)
$27,002.38	Subtotal
5,940.52	Staff Benefits (22%)
$32,942.90	Position Total

Secretary (9A) — $ 4,505.46

Secretarial services would be necessary for three months to type project results for publication and maintain files on project documentation.

$3,693.00	Salary ($1,231 per month x 3 months)
812.46	Staff Benefits (22%)
$4,505.46	Position Total

Horticulture Trainee (11A) (Temporary Help) — $6,402.56

This position would be necessary to perform maintenance and gardening functions and other tasks. This person would weed, care for harvest, weigh garden products and perform other labor functions.

$5,248.00	Salary ($1,312 per month x 4 months)
1,154.56	Staff Benefits (22%)
$6,402.56	Position Total

400 Commodities — $2,500.00

Supplies necessary to continue waste heat research:

a) Fertilizers and Growth Media	$ 550.00
b) Pots	225.00
c) Plants and Seed	1,725.00
	$2,500.00

TOTAL FY 79 COSTS — $46,350.92

AMENDMENT #1

OFFERED IN THE HOUSE: BY: HOUSE COMMERCE COMMITTEE

TO: SPONSOR SUBSTITUTE FOR HOUSE BILL No. 155

SENATE BILL No. _____

PAGE: 1 LINE: 13

After "to", insert "the Department of Commerce for the purpose of contracting with";

After "Alaska", delete "for the purpose of providing ~~for~~", and insert "to provide".

Introduced: 2/2/77
Referred: Commerce and Finance

IN THE HOUSE BY COWPER

HOUSE BILL NO. 155

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of $100,000 is appropriated from the general fund to the University of Alaska for the purpose of providing personnel and materials to utilize a facility constructed by the United States Army at Fort Wainwright, Alaska, for the purpose of dissipating surplus heat into the soil. The personnel and materials will be used to develop the technology necessary to use other sources of surplus heat for the enhancement of horticulture in Alaska.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1978.

* Sec. 3. This Act takes effect July 1, 1977.

Introduced: 2/9/77
Referred: Commerce and Finance

IN THE HOUSE BY COWPER

SPONSOR SUBSTITUTE FOR HOUSE BILL NO. 155

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of $102,000 is appropriated from the general fund to the University of Alaska for the purpose of providing personnel and materials to utilize a facility constructed by the United States Army at Fort Wainwright, Alaska, to study the effects of dissipating surplus heat into the soil. The personnel and materials will be used to develop the background and technology necessary to use other sources of surplus heat for the enhancement of horticulture in Alaska.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Sec. 3. This Act takes effect immediately in accordance with AS 01.10.-070(c).

"An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; effective date."

COMMITTEE REPORT

2/28/77

HOUSE

_____ Date

Mr. Speaker:

The Committee on FINANCE has had SSHB xxx 155 under consideration. A majority of the members of the Committee

/ / recommends it do pass

/ / recommends it do not pass

/ / recommends it be replaced with CS for _____ and that CS for _____ do pass

/ / (and) recommends it be referred to the _____ committee

/ / reports it back without recommendation

/ / AND attaches a report of its intent

/ / (other) _____

MEMBERS SIGNING THE MAJORITY REPORT:

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

MEMBERS NOT CONCURRING IN THE MAJORITY REPORT:

_____ recommends: _____

_____ recommends: _____

_____ recommends: _____

_____
Chairman

"An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; and providing for an effective date."

COMMITTEE REPORT

2-9-77 **HOUSE** FINANCE

2/28/77 Date

Mr. Speaker:

The Committee on COMMERCE has had SSHB 155 under consideration. A majority of the members of the Committee

/_7 recommends it do pass

/_7 recommends it do not pass

/X7 recommends it do pass with attached amendment(s)

/_7 recommends it be replaced with CS for ______ and that CS for ______ do pass

/_7 (and) recommends it be referred to the ______ committee

/_7 reports it back without recommendation

/_7 AND attaches a report of its intent

/X7 (other) AND ATTACHES A FISCAL NOTE (SSSB 13, S Supp 14 p 1-5)

MEMBERS SIGNING THE MAJORITY REPORT:

[signature]	Do Pass as Amended	
[signature]		
[signature]	" " "	"
[signature]	" " "	"
[signature]	" " "	"

MEMBERS NOT CONCURRING IN THE MAJORITY REPORT:

Joe McKinnon recommends: " " " "

______ recommends: ______

______ recommends: ______

Joe McKinnon
Chairman

H 60

AMENDMENT #1

OFFERED IN THE HOUSE: BY: HOUSE COMMERCE COMMITTEE

TO: SPONSOR SUBSTITUTE FOR HOUSE BILL No. 155

SENATE BILL No. _____

PAGE: 1 LINE: 13

After "to", insert "the Department of Commerce for the purpose of contracting with";

After "Alaska", delete "for the purpose of providing ~~for~~", and insert "to provide".

walker

Introduced: 2/9/77
Referred: Commerce and Finance

IN THE HOUSE BY COWPER

SPONSOR SUBSTITUTE FOR HOUSE BILL NO. 155

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of $102,000 is appropriated from the general fund to the University of Alaska for the purpose of providing personnel and materials to utilize a facility constructed by the United States Army at Fort Wainwright, Alaska, to study the effects of dissipating surplus heat into the soil. The personnel and materials will be used to develop the background and technology necessary to use other sources of surplus heat for the enhancement of horticulture in Alaska.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Sec. 3. This Act takes effect immediately in accordance with AS 01.10.-070(c).

SSHB 155

STATE OF ALASKA
THE LEGISLATURE
LEGISLATIVE AFFAIRS AGENCY

POUCH Y - STATE CAPITOL
JUNEAU, ALASKA 99811
907-465-3800

MEMORANDUM

February 3, 1977

SUBJECT: Fiscal Note for Sponsor Substitute for Senate Bill 13

TO: The Honorable J. Kerttula

FROM: Deborah Behr (DB)
Research Analyst

Attached please find the fiscal note you requested on the special appropriation to the University of Alaska for a study of surplus heat utilization. The fiscal note was prepared by Dr. Donald Dinkel, professor of plant physiology for the University of Alaska.

I hope this answers your request. If you require additional details on this topic, please do not hesitate to contact me at 465-4917.

DB:jm
Attachment

SSHB 155

THE LEGISLATURE OF THE STATE OF ALASKA
TENTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. Sponsor Substitute for Senate Bill No. 13
Title "An Act Making a Special Appropriation To University of Alaska ...for the study of ~~XXXXXXXXXX~~ Surplus Heat Utilization..." Date January 26, 1977
REQUESTED BY Senator Kerttula

II. FISCAL DETAIL
Agency Affected University of Alaska
Program Category Affected Education
Budget Request Unit(s) Affected Agricultural Experiment Station/Organized Research

EXPENDITURES (Thousands of Dollars)

		FY 77	FY 78	FY 79	FY 80	FY 81	FY 82
100	PERSONAL SERVICES	4.2	40.7	43.9	-0-	-0-	-0-
200	TRAVEL	-0-	2.3	-0-	-0-	-0-	-0-
300	CONTRACTUAL	-0-	1.7	-0-	-0-	-0-	-0-
400	COMMODITIES	-0-	5.5	2.5	-0-	-0-	-0-
500	EQUIPMENT	-0-	0.5	-0-	-0-	-0-	-0-
600	LAND & STRUCTURES	-0-	-0-	-0-	-0-	-0-	-0-
700	GRANTS, CLAIMS, ETC.	-0-	-0-	-0-	-0-	-0-	-0-
	TOTAL	4.2	50.7	46.4	-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND	4.2	50.7	46.4	-0-	-0-	-0-
FEDERAL FUNDS	-0-	-0-	-0-	-0-	-0-	-0-
OTHER (Specify)	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS

FULL TIME	1	1	1	-0-	-0-	-0-
PART TIME	-0-	-0-	1	-0-	-0-	-0-
TEMPORARY	1	1	1	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III)

See Attachment

Donald H. Dinkel

IV. DATE January 27, 1977 PREPARED BY Dr. Donald H. Dinkel, Professor of Plant
AGENCY Physiology, Agricultural Experiment Station
PHONE 479-7652 University of Alaska

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named)

33-001 (Rev. 10/76)

Sponsor Substitute for
Senate Bill No. 13
Project Summary Totals

100	Personal Services		$ 88,716.84
	FY 77	$ 4,209.97	
	FY 78	$40,655.95	
	FY 79	$43,850.92	
200	Travel		$ 2,350.00
	FY 77	$ 0	
	FY 78	$ 2,350.00	
	FY 79	$ 0	
300	Contractural Services		$ 1,700.00
	FY 77	$ 0	
	FY 78	$ 1,700.00	
	FY 79	$ 0	
400	Commodities		$ 8,040.00
	FY 77	$ 0	
	FY 78	$ 5,540.00	
	FY 79	$ 2,500.00	
500	Equipment		$ 500.00
	FY 77	$ 0	
	FY 78	$ 500.00	
	FY 79	$ 0	
		TOTAL	$ 101,306.84

IV

Or

cc:

SSHB 155

Sponsor Substitute for
Senate Bill No. 13
Analysis of Fiscal Note

FY 77 Costs

100 Personal Services $4,209.97

Senior Research Assistant (21A) $2,635.57

This position would be employed for one month prior to FY 78 to begin implementation of the research project. The Senior Research Assistant would be a specialist in horticulture technology and would be responsible for data analysis, background preparation, and other duties as assigned by the project head.

$1,895.00	Salary ($1,895.00 per month x 1 month)
301.31	Leave Allowance (15.9%)
$2,196.31	Subtotal
439.26	Staff Benefits (20%)
$2,635.57	Position Total

Horticulture Trainee (11A) (Temporary Help) $1,574.40

This position would be employed for one month prior to FY 78 to perform gardening functions and other tasks. This position would weed, care for harvest, weigh the garden products, and perform other labor duties.

$1,312.00	Salary ($1,312.00 x 1 month)
262.40	Staff Benefits (20%)
$1,574.40	Position Total

TOTAL FY 77 COSTS $4,209.97

Sponsor Substitute for
Senate Bill No. 13

FY 78 Costs

100 Personal Services $40,655.95

Senior Research Assistant (21A) $31,209.55

This position would be needed for 12 months to develop the project. The person employed would be a horticulture specialist who would care for plants, calculate data documenting project accomplishments, and do other duties as assigned by the project head.

$22,440.00	Salary ($2,040.00 per month x 11 months)
3,567.96	Leave Allowance (15.9%)
$26,007.96	Subtotal
5,201.59	Staff Benefits (20%)
$31,209.55	Position Total

Horticulture Trainee (11A) $ 9,446.40
(Temporary Help)

This position would be responsible for performance of horticulture labor functions related to the project. The person would do maintenance duties of weeding, caring for plants, etc.

$7,872.00	Salary ($1,312.00 per month x 6 months)
1,574.40	Staff Benefits (20%)
$9,446.40	Position Total

200 Travel $ 2,350.00

Travel required to review waste heat agriculture projects in parts of United States, such as Minnesota, Oregon, Idaho, etc., to analyze various techniques for application in Alaska. $ 850.00

Iceland is one of the major countries that currently employes waste heat for industry uses. A review of its techniques would be done to examine for methods useable in Alaskan environment. $ 1,200.00

Three trips to and from Palmer would be necessary to build greenhouse facilities. Transportation to install equipment and appliances would be required. $ 300.00

SSHB 155

Sponsor Substitute for
Senate Bill No. 13

FY 79 Costs

100 Personal Services $43,850.92

Senior Research Assistant (21B) $32,942.90

This position would be responsible for maintenance and completion of the project. The person would also prepare documentation for publication on the results.

$23,298.00	Salary ($2,118.00 per month x 11 months)
3,704.38	Leave Allowance (15.9%)
$27,002.38	Subtotal
5,940.52	Staff Benefits (22%)
$32,942.90	Position Total

Secretary (9A) $ 4,505.46

Secretarial services would be necessary for three months to type project results for publication and maintain files on project documentation.

$3,693.00	Salary ($1,231 per month x 3 months)
812.46	Staff Benefits (22%)
$4,505.46	Position Total

Horticulture Trainee (11A) $6,402.56
(Temporary Help)

This position would be necessary to perform maintenance and gardening functions and other tasks. This person would weed, care for harvest, weigh garden products and perform other labor functions.

$5,248.00	Salary ($1,312 per month x 4 months)
1,154.56	Staff Benefits (22%)
$6,402.56	Position Total

400 Commodities $2,500.00

Supplies necessary to continue waste heat research:

a) Fertilizers and Growth Media	$ 550.00
b) Pots	225.00
c) Plants and Seed	1,725.00
	$2,500.00

TOTAL FY 79 COSTS $46,350.92

ALASKA STATE LEGISLATURE

TENTH Legislature FIRST Session

SPONSOR SUBSTITUTE
HOUSE BILL NO. 155

By COWPER

"An Act making a special appropriation to the University of Alaska to provide personnel and materials to operate a research facility for the study of surplus heat utilization at Fort Wainwright; and providing for an effective date."

Surplus heat
Research facility - Ft. Wainwright

Introduced in the House 2-9, 19 77.

HISTORY IN THE HOUSE

19 77		Read first time and referred to Committee on
Feb.	9	Commerce and Finance
		Reported back with recommendation that
		Read second time and
		Read third time and

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reconsideration

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reported correctly engrossed
Signed by Speaker
Sent to Senate

CHIEF CLERK OF THE HOUSE

HISTORY IN THE SENATE

19		Read first time and referred to Committee on
		Reported back with recommendation that
		Read second time and
		Read third time and

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reconsideration

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reported correctly engrossed
Signed by President
Returned to House

SECRETARY OF THE SENATE

HISTORY IN THE HOUSE

19		Received from Senate
		Concurred in Senate amendment thus adopting:
		Failed to concur in Senate amendment; asked Sen. to recede
		Senate receded from amendment
		Senate failed to recede from amendment
		FCC appointed by House
		FCC appointed by Senate
		FCC adopted
		To enrolling
		Reported correctly enrolled
		Sent to Governor
		..... by Governor
		Filed with Lt. Governor
		Chapter No. .....

31-002

RECORDS CERTIFICATION

I, the undersigned, an employee of the State of Alaska, do hereby certify that the microfilm images on this microform are accurate reproductions of the original records of the State of Alaska as accumulated during the regular course of business, and that it is the established policy and practice of this State to microfilm its records and to dispose of the original records after microfilm reproductions have been made.

James O. Smith
Signature of Camera Operator

2/14/90
Date

02-519 (REV 8/78)

"An Act making a special appropriation to the U of A for a study to develop the technology for using waste heat generated by the pipeline for agricultural purposes; effective date."

COMMITTEE REPORT

2/18/77 HOUSE

Mr. Speaker: Date _____

The Committee on FINANCE has had HB 158

under consideration. A Majority of the members of the Committee

( ) recommends it DO PASS

( ) recommends it DO NOT PASS

( ) recommends it DO PASS WITH ATTACHED AMENDMENT(S)

( ) recommends it BE REPLACED WITH CS FOR _____ AND THAT CS FOR _____ DO PASS

( ) "and" recommends it BE REFERRED TO THE _____ COMMITTEE

( ) reports it back WITHOUT RECOMMENDATION

( ) "other"

Members signing the Majority report:

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Members NOT concurring in the Majority report:

_____ recommends:

_____ recommends:

_____ recommends:

_____ recommends:

_____ recommends:

_____ Chairman

"An Act making a special appropriation to the University of Alaska for a study to develop the technology for using waste heat generated by the pipeline for agricultural purposes; and providing for an effective date."

COMMITTEE REPORT

2-2-77

HOUSE

FINANCE

2/15/77 Date

Mr. Speaker:

The Committee on RESOURCES has had HB 158 under consideration. ~~A majority~~ 3 of the members of the Committee

☐ recommends it do pass

☐ recommends it do not pass

☐ recommends it do pass with attached amendment(s)

☒ recommends it be replaced with CS for ~~HB 158~~ and that

CS for ~~HB 158~~ do pass

☐ (and) recommends it be referred to the committee

☐ reports it back without recommendation

☐ AND attaches a report of its intent

☐ (other)

MEMBERS SIGNING THE MAJORITY REPORT:

(1)	Mills	Do PASS	(2) Alvin Osterbach ~~NO REC~~
	Akers	Do PASS	
	Green Smith	Do Pass	
(2)	Merle G Snider	NO Recommendation	

MEMBERS NOT CONCURRING IN THE MAJORITY REPORT:

_____ recommends: _____

_____ recommends: _____

_____ recommends: _____

Alvin Osterbach
Chairman

H 60

3218
Walker

Original sponsor: Cowper

Offered: 2/18/77
Referred: Finance

IN THE HOUSE BY THE RESOURCES COMMITTEE

CS FOR HOUSE BILL NO. 158

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska to determine the feasibility of using waste heat generated by the trans-Alaska pipeline for grain and forage drying; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of $100,000 is appropriated from the general fund to the University of Alaska for a study to determine the feasibility of using waste heat recovered from pump station no. 9 of the trans-Alaska pipeline to dry grains and forages for livestock feed.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Sec. 3. This Act takes effect immediately in accordance with AS 01.10.-070(c).

Introduced: 2/2/77
Referred: Resources and Finance

3218
Walker

IN THE HOUSE BY COWPER

HOUSE BILL NO. 158

IN THE LEGISLATURE OF THE STATE OF ALASKA

TENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act making a special appropriation to the University of Alaska for a study to develop the technology for using waste heat generated by the pipeline for agricultural purposes; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. The sum of $100,000 is appropriated from the general fund to the University of Alaska for a study to develop the technology necessary for utilizing waste heat in Alaska for the production of intensively cultivated agricultural crops.

* Sec. 2. The unexpended and unobligated portion of this appropriation lapses into the general fund June 30, 1979.

* Sec. 3. This Act takes effect immediately in accordance with AS 01.10.-070(c).

COMMITTEE COPY

ALASKA STATE LEGISLATURE

TENTH Legislature FIRST Session

HOUSE BILL NO. 158

By COWPER

"An Act making a special appropriation to the University of Alaska for a study to develop the technology for using waste heat generated by the pipeline for agricultural purposes; and providing for an effective date."

Spec. Approp.
U of A study of waste heat

Introduced in the House 2-2, 19 77

HISTORY IN THE HOUSE

19 77

Feb. 2 Read first time and referred to Committee on Resources and Finance

Reported back with recommendation that

Read second time and

Read third time and

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reconsideration

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reported correctly engrossed
Signed by Speaker
Sent to Senate

CHIEF CLERK OF THE HOUSE

HISTORY IN THE SENATE

19

Read first time and referred to Committee on

Reported back with recommendation that

Read second time and

Read third time and

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reconsideration

PASS	Effective Date
Yeas	Yeas
Nays	Nays
Absent	Absent
Excused	Excused

Reported correctly engrossed
Signed by President
Returned to House

SECRETARY OF THE SENATE

HISTORY IN THE HOUSE

19

Received from Senate

Concurred in Senate amendment thus adopting:

Failed to concur in Senate amendment; asked Sen. to recede

Senate receded from amendment

Senate failed to recede from amendment

FCC appointed by House

FCC appointed by Senate

FCC adopted

To enrolling

Reported correctly enrolled

Sent to Governor

..... by Governor

Filed with Lt. Governor

Chapter No. .....

31-002

THE LEGISLATURE OF THE STATE OF ALASKA
TENTH LEGISLATURE

FISCAL NOTE

I. REQUEST

Bill/Resolution No. Senate Bill No. 87 or CSHB 158

Title "An Act Making A Special Appropriation to the University of Alaska to Determine Feasibility of Using Waste Heat for Grain Drying" Date 9 February, 1977

REQUESTED BY Senator Kerttula

II. FISCAL DETAIL

Agency Affected University of Alaska

Program Category Affected Agricultural Experiment Station

Budget Request Unit(s) Affected Organized Research

EXPENDITURES (Thousands of Dollars)

		FY 77	FY 78	FY 79	FY 80	FY 81	FY 82
100	PERSONAL SERVICES	3.4	24.6	37.9	-0-	-0-	-0-
200	TRAVEL	-0-	3.5	0.5	-0-	-0-	-0-
300	CONTRACTUAL	-0-	10.2	7.2	-0-	-0-	-0-
400	COMMODITIES	0.2	0.2	0.3	-0-	-0-	-0-
500	EQUIPMENT	2.5	9.5	-0-	-0-	-0-	-0-
600	LAND & STRUCTURES	-0-	-0-	-0-	-0-	-0-	-0-
700	GRANTS, CLAIMS, ETC.	-0-	-0-	-0-	-0-	-0-	-0-
	TOTAL				-0-	-0-	-0-

FUNDING (Thousands of Dollars)

GENERAL FUND	6.1	48.0	45.9	-0-	-0-	-0-
FEDERAL FUNDS	-0-	-0-	-0-	-0-	-0-	-0-
OTHER (Specify)	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS

FULL TIME	1	2	2	-0-	-0-	-0-
PART TIME	-0-	-0-	1	-0-	-0-	-0-
TEMPORARY	-0-	1	1	-0-	-0-	-0-

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III)

See Attachment

IV. DATE 9 February, 1977

PREPARED BY Dr. F.J. Wooding, Dr. C.E. Lewis

AGENCY Agricultural Experiment Station

PHONE 479-7188 University of Alaska

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named)

CSHB 158 or
Senate Bill No. 87
Project Summary Totals

100	Personal Services		$ 65,857.39
	FY 77	$ 3,394.61	
	FY 78	$24,604.62	
	FY 79	$37,858.16	
200	Travel		$ 4,000.00
	FY 77	$ -0-	
	FY 78	$ 3,500.00	
	FY 79	$ 500.00	
300	Contractural Services		$ 17,400.00
	FY 77	$ -0-	
	FY 78	$10,200.00	
	FY 79	$ 7,200.00	
400	Commodities		$ 700.00
	FY 77	$ 200.00	
	FY 78	$ 200.00	
	FY 79	$ 300.00	
500	Equipment		$ 12,000.00
	FY 77	$ 2,500.00	
	FY 78	$ 9,500.00	
	FY 79	$ -0-	
		TOTAL	$ 99,957.39

SB 87 or CSHB 158

Analysis of Fiscal Note

FY 77 Costs

100	Personal Services		$ 3,394.61
	Assistant Professor of Resource Systems	$ 3,394.61	

This position would be employed for one month prior to FY 78 to begin implementation of the research project. It is the responsibility of the position to act as project co-principal investigator and to conduct the cost analysis, assist in data analysis of grains, and interact with technological contractural services provided.

$2,482.13	Salary ($2,482.13 per month X 1 month)
394.66	Leave Allowance (15.9%)
$2,876.79	Subtotal
517.82	Staff Benefits (18%)
$3,394.61	Position Total

400	Commodities		$ 200.00
	a) Bag tags and grain bags	$ 200.00	
500	Equipment		$ 2,500.00
	a) Laboratory grain dryer and associated equipment	$ 1,000.00	
	b) Grain storage bins	$ 1,500.00	
	TOTAL FY 77 COSTS		$ 6,094.61

CSHB 158 or
Senate Bill No. 87

FY 78 Costs

100 Personal Services $24,604.62

Assistant Professor of Resource Systems $11,392.14

This position would be employed for three months to develop and coordinate the project. It is the responsibility of the position. to act as project co-principal investigator and to conduct the cost analysis, assist in data analysis of grains, and interact with technological contractural services provided.

$ 8,191.02	Salary ($2,730.34 per month X 3 months)
1,302.36	Leave Allowance (15.9%)
$ 9,493.38	Subtotal
1,898.76	Staff Benefits (20%)
$11,392.14	Position Total

Senior Research Assistant (21A) $11,922.48

This position would be employed for four months to develop the project. The person employed would be an agronomic specialist, skilled in laboratory techniques and would aid in laboratory work, calculating data and other duties assigned by the project heads.

$ 8,572.40	Salary ($2,143.10 per month X 4 months)
1,363.00	Leave Allowance (15.9%)
$ 9,935.40	Subtotal
1,987.08	Staff Benefits (20%)
$11,922.48	Position Total

Agricultural Laborer (11A) $ 1,290.00
(Temporary Help)

This position would be responsible for field work associated with grain harvest and storage and would be employed for one month.

$ 1,075.00	Salary ($1,075.00 per month X 1 month)
215.00	Staff Benefits (20%)
$ 1,290.00	Position Total

200	Travel		$ 3,500.00
	Travel required to review waste heat agricultural projects in parts of United States, such as California, Washington, Oregon, etc. to analyze various drying techniques for application in Alaska.	$ 1,000,00	
	The Scandanavian countries and England currently employ waste heat in the processing of agricultural products, particularly high moisture grains. A review of the techniques would be done to determine applications in Alaska.	$ 2,000.00	
	Approximately 20 trips to and from Delta Junction (Pump Station #9 site and field plot site) would be necessary during equipment adaption and harvest.	$ 500.00	
300	Contractural Services		$10,200,00
	Contractural services will be used to determine types and amount of fungal organisms and amounts or presence of micro toxins in stored grains; analysis of carbohydrate content (sugars & starches); and amino acid analysis of proteins.	$ 1,700.00	
	Technological consultants will be used for aid in analysis of technology for utilizing waste heat for grain drying and for aid in equipment design and installation.	$ 8,000.00	
	Computer run time will be necessary for cost analysis and grain analysis.	$ 500.00	
400	Commodities		$ 200.00
	a) Bag tags and grain bags	$ 200.00	
500	Equipment		$ 9,500.00
	200 bushel per hour grain dryer, conversion and heat transfer equipment.	$ 9,500.00	
	TOTAL FY 78 COSTS		$48,004.62

CSHB158 or
Senate Bill No. 87

FY 79 Costs

100 Peraonal Services $37,858.16

Assistant Professor of Resource Systems $12,740.13

This position would be employed for three months to coordinate and complete the project. The position would also collaborate in preparation of documentation for publication of the project results.

$ 9,010.11	Salary ($3,003.37 per month X 3 months)
1,432.62	Leave Allowance (15.9%)
$10,442.73	Subtotal
2,297.40	Staff Benefits (22%)
$12,740.13	Position Total

Senior Research Assistant (21A) $16,666.65

This position would be employed for five months to maintain and complete the project. The position would also assist in preparation of documentation of project results as assigned by project heads.

$11,787.05	Salary ($2,357.41 per month X 5 months)
1,874.15	Leave Allowance (15.9%)
$13,661.20	Subtotal
3,005.45	Staff Benefits (22%)
$16,666.65	Position Total

Secretary (12A) $ 4,123.43

Secretarial services would be necessary for two months to type project results and be responsible for any duties necessary for publication of documentation.

$ 3,379.86	Salary ($1,689.93 per month X 2 months)
743.57	Staff Benefits (22%)
$ 4,123.43	Position Total