USOM THAILAND

LAM NAM OON

IRRIGATION PROJECT

AID LOAN NO. 493-H-013

1963

to

AUGUST 1970

Quentin J. Wildman
General Engineer CD/CP
Agency for International Development
Bangkok, Thailand

August 1970

BIO-DATA : Quentin J. Wildman

Birth date: Birthplace:

Education: 1. Omaha University Omaha, Nebraska
2. Iowa State University, Ames, Iowa
B.S. in Civil Engineering, 1950
3. Advanced Management Program Harvard Business School, 1965.

Military Service: 1. 1943-1946 M/SGT Liaison Pilot Overseas, Germany
2. 1st Lt. Iowa National Guard.

1950	Right of Way Department Iowa State Highway Commission.
1950-1954	(1) Field Engineer (2) Assistant Manager of Utilities, City of Fort Dodge, Iowa.
1954-1956	City Engineer and Water Superintendent City of Boone, Iowa.
1956-1957	(1) Building Grounds & Utilities (2) Major Projects Engineer Owens-Corning Fiberglas
1958	Employed by consulting firm on ICA contract in Jordan as Municipal Advisor to the Development Board of Jordan.
1959-1963	Chief of Water Section, USOM Saigon.
1964-1965	Chief of Water Resources Branch, Office of Engineering for the Far East Bureau AID/W.
1965-1968	General Engineer USOM Korea.
1968-1970	Chief of Water Resources Division, USOM Bangkok.

ABSTRACT

LAM NAM OON IRRIGATION PROJECT

LOAN 493-14-013

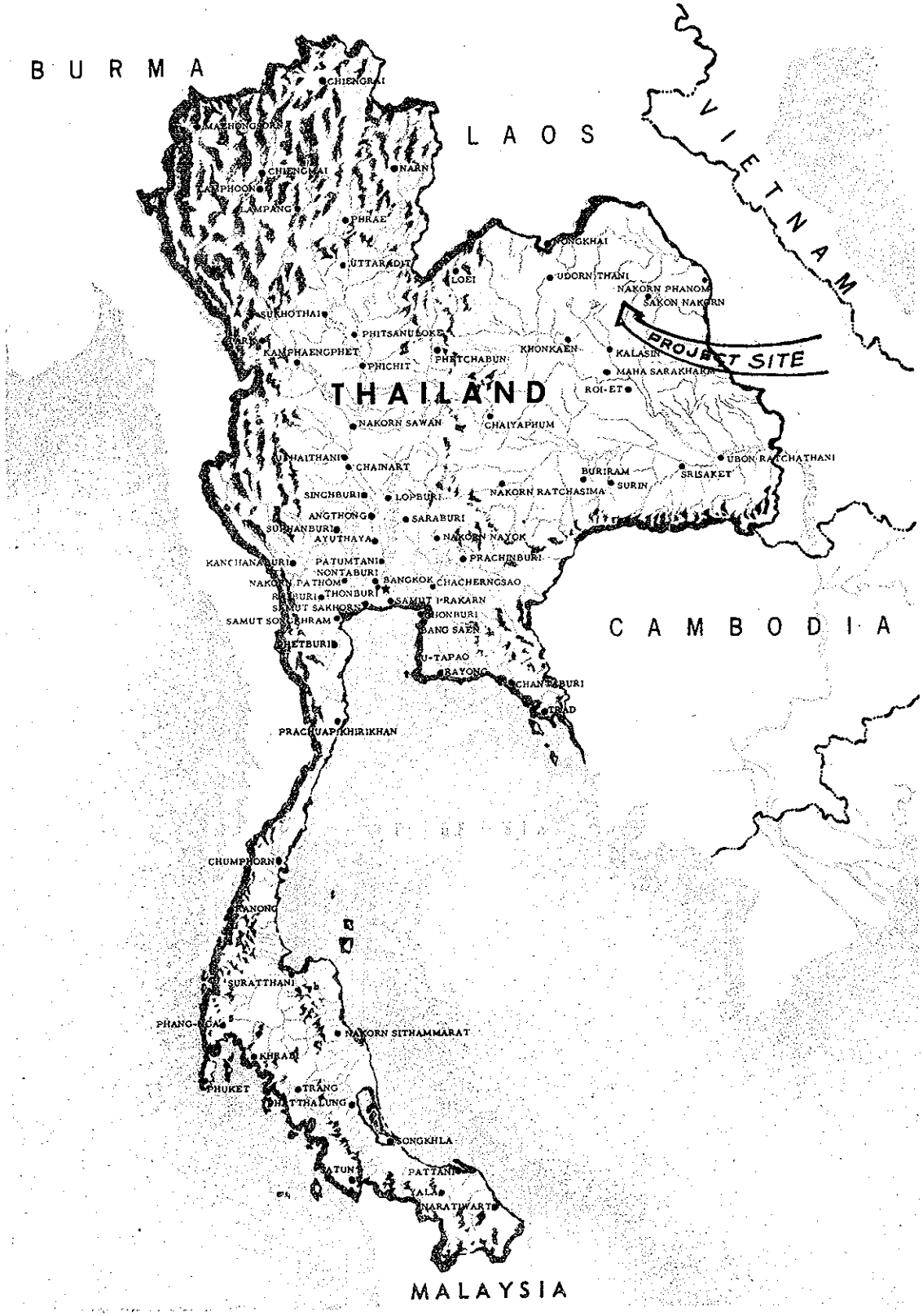
This project is an earthfill dam approximately 45 kilometers west of Sakon Nakhon in Northeast Thailand. 142 kilometers of canals and laterals will deliver water to irrigate 203,000 rai of land. (105,000 in the dry season). The benefits are primarily from increased agricultural production. This is part of the Thai government's program to improve living standards in Northeast Thailand.

The total cost of project is estimated to be $21,925,000 of which $3,500,000 will require foreign exchange. The foreign exchange is being financed by an AID Loan and is being used to buy construction equipment.

The project is being implemented by the Royal Irrigation Department of the Royal Thai Government. The Royal Irrigation Department has contracted with Engineering Consultants Incorporated of Denver, Colorado, to furnish engineering and other technical assistance in the design and construction of the project.

The project is only about 15% completed with completion scheduled for 1972. A more likely completion date is 1973.

LAM NAM OON



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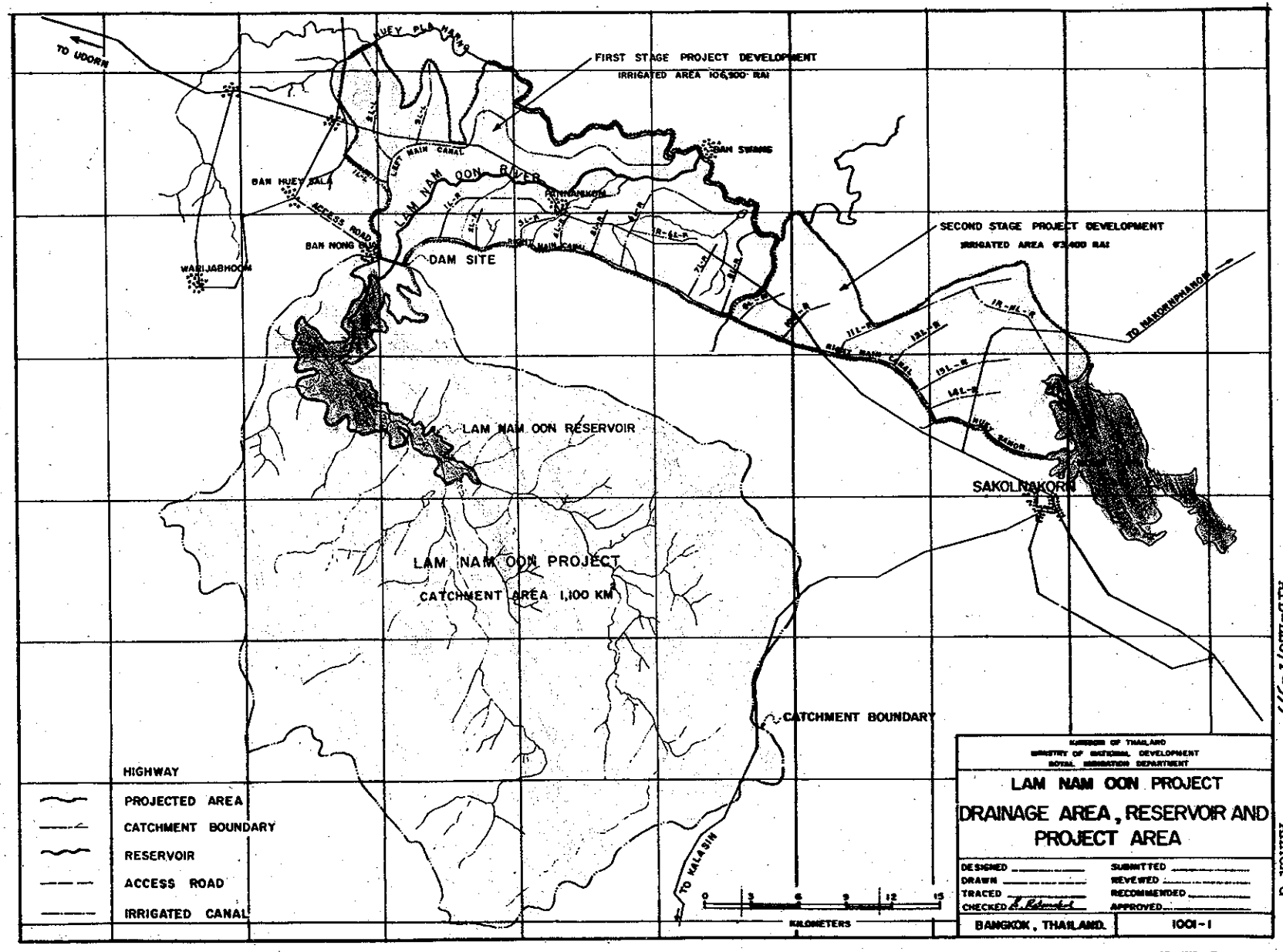

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Annex G

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LAM NAM OON IRRIGATION PROJECT

Loan No. 493-H-013

Date of Agreement	:	September 11, 1967
Loan Amount	:	$3,500,000 U.S. dollars
Total Cost	:	$21,925,000 U.S. dollar equivalent
Terms	:	25 years 5 years grace period on the principal (after 1st disbursement)
		3.1/2% Semi Annual Payments
		Repayable in U.S. dollars.

Capital Assistance Committee 1967

Capital Development Officer	John Standish
Economist	Gordon Pierson/Peter Gajewski
Engineer	Allan D. Replogle
Program Analyst	Leroy L. Wagner
Loan Officer	Robert G. Pratt
Counsel	John A. Hoskins

1970

Project Officer	George Pierce
Loan Officer	William McDonald
Legal Advisor	Edna Boorady

CHRONOLOGY OF KEY EVENTS

RID's Feasibility Report	-	Nov. 5, 1963
BUREC's Review dated	-	Nov. 6, 1964
RID's Supplementary Report	-	Feb. 1965
RID's Third Revision	-	Mar. 1965
BUREC's Initial Review	-	Aug. 23, 1965
BUREC's Supplemental Comments	-	Sept. 29, 1965
RID's Feasibility Report	-	July 30, 1966
BUREC's Comments	-	Feb. 20, 1967
RID Submitted Project to NEDB	-	Mar. 1967
NEDB Submits Proposal to Cabinet	-	Apr. 12, 1967
RTG Formal Loan Application	-	May 25, 1967
Capital Assistance Paper	-	June 12, 1967
Loan Authorized	-	June 21, 1967
Loan Signed	-	Sept. 11, 1967
Engineering Contract Signed	-	June 14, 1968
Initial Conditions Precedent Met	-	June 14, 1968
All Conditions Precedent Met	-	May 29, 1969
Feasibility Report Supplement	-	June 1970

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GLOSSARY OF NAMES

AID	-	Agency for International Development
AID/W	-	Agency for International Development, Washington
BUREC	-	Bureau of Reclamation
ECI	-	Engineering Consultants Incorporated
EXIMBANK	-	Export-Import Bank
FAO	-	Food and Agriculture Organization of the United Nations
IBRD	-	International Bank for Reconstruction and Development
IFB	-	Invitation for Bid
NEDB	-	National Economic Development Board, Thailand
PASA	-	Participating Agency Service Agreement
RID	-	Royal Irrigation Department, Thailand
RTG	-	Royal Thai Government
USOM	-	United States Operations Mission

CONVERSION UNITS

1 rai	=	40 x 40 meters	=	1600 square meters
2.53 rai	=	0.41 hectare	=	1 acre
6.25 rai	=	1 hectare	=	2.47 acres

I. INTRODUCTION

A. DESCRIPTION*

The Lam Nam Oon is a multipurpose project with principal benefits being irrigation and flood control. Other benefits will include domestic water supply, fishing and recreation.

The total estimated cost of the project is $21,925,000 U.S. equivalent of which $3,500,000 for foreign exchange costs is being loaned to the Royal Thai Government (RTG) by the Agency for International Development (A.I.D.).

The principal construction features are an earthfill storage dam with controlled outlets to canals and laterals to serve 203,000 rai of irrigable land. The dam is approximately 45 kilometers west of Sakon Nakhon.

B. LOAN BACKGROUND

This project has been high on the priority list projects for the development of the water resources of Thailand. All water projects of higher priority have either been completed or are now under construction.

Added impetus was given to this project by the interest of the US and RTG in counter insurgency measures. The project area was considered the second most active insurgent area in Thailand, at the time the loan was made.

* A more detailed description is given in Section III of this report.

Efforts are to be made by other RTG departments to accelerate assistance to roads education, schools, medical facilities, police and other governmental functions in the area.

At the time of the loan application was received it was not AID's policy to provide development loans for capital projects in Thailand. The RTG had substantial foreign exchange reserves and resources. Capital was being made available by International Bank for Reconstruction and Development (IBRD), Export-Import Bank (Eximbank), and other members of the consultive group for Thailand. The proposed project did clearly meet AID's criteria for an exception to the general policy. AID was willing to consider loan financing for capital projects which offered both economic development and significant security benefits when other free world lenders were not prepared to finance them promptly.

The provisions for access roads to the dam site, and roadways provided by the canal berms, will provide increased mobility for security forces in the project area which is in the heart of the insurgency area. The project should further increase the capability of RID, which was already recognized as one of the more capable of Thai Government Departments. The increased agricultural production made possible by irrigation and flood control will directly contribute to rural economic development. The collateral benefits of

resettlement, agricultural extension, and farmer associations for credit, storage, and marketing, to be provided as required under the conditions precedent, will strengthen social development activities of Accelerated Rural Development Program (ARD) in this area.

II. THE MAKING OF A LOAN

A. HISTORY OF PROJECT.

In 1948 the FAO made a survey of Thailand and recommended increased emphasis on the development of Thailand's water resources as a means for increased agricultural production.

After surveying many potential water resource projects the Royal Irrigation Department (RID) proceeded to make feasibility studies of a priority list of projects. Relatively high on the list was the Lam Nam Oon Project.

Upon completion of its preliminary investigation of the hydrologic, engineering, and agricultural aspects of the Project, the Royal Irrigation Department (RID) prepared its "Feasibility Report, Lam Nam Oon Project". This report, dated November 5, 1963, was submitted to USOM/Thailand which in turn referred it through AID/W to the U. S. Bureau of Reclamation (BUREC) for review under terms of a Participating Agency Service Agreement (PASA). BUREC's principal review comments were transmitted to AID/W under letter of November 6, 1964.

A further review of RID's Supplementary Report and third revision of the main report, dated February and March 1965, respectively, and prepared in response to BUREC's initial

review comments, was completed by BUREC and transmitted to AID/W under letter of August 23, 1965, with supplemental comments transmitted under letter of September 29, 1965.

Based upon this second review, the RID issued a feasibility report dated July 30, 1966, which included additional and supplemental data.

Meanwhile, the "Yellow Book" or "Development Projects Requiring Foreign Financial Assistance under the Second Plan" was initially prepared by NEDB in May, 1966, and presented as a working paper to the second meeting of the Consultative Group for Thailand in London. In September, 1966, the "Yellow Book" was revised and distributed to Consultative Group members. This list included twelve water resources development projects with a total estimated cost of $421 million ($141.3 million in foreign exchange). The Lam Nam Oon was accorded second priority among these projects. (The first priority, Sirikit Dam multi-purpose project, is underway with an IBRD loan of $10 million toward its $71.5 million total costs.)

In response to President Johnson's 1965 call, given at Johns Hopkins University, for Asia cooperation in a $1 billion program of U.S. Special Assistance to develop Southeast Asia, the RTG

had presented Eugene Black with a "Pink Book" in June 1965. This "Selected Capital Projects Seeking U. S. Special Assistance" listed thirteen projects in order of priority which had been selected by NEDB on the basis of their importance to national security and their capability of bringing mass benefits within a reasonable period of time, as well as readiness for immediate implementation. Lam Nam Oon was number five on this list. All but two of these projects were then in some stage of implementation, nine of the eleven with U. S. assistance.

As a sub-plan under the Second National Plan, the RTG had an Over-all Northeast Development Plan. Irrigation projects in this plan were originally conceived by RID as part of a Northeast Water Resources Program in 1960. These projects, in order of priority assigned by RID, and the 1967 and 1970 status are listed on the following page.

In every listing of priority development plans, the RTG gave very high priority to Lam Nam Oon. As is the case for many projects in North Thailand, early economic returns are not as attractive as are those of project proposals in other regions of the country. This is one of the primary reasons that IBRD was not interested in this project, and undoubtedly it is also contributory to Eximbank's disinterest. The project's location in Sakhon Nakhon

PROJECT	STATUS 1967	1970
1. Nam Pong in Khon Kaen	Completed with German aid.	-
2. Nam Pung in Sakhon Nakhon	Completed by RTG.	-
3. Lam Pao in Kalasin	Under construction, AID Loan 493-H-010.	Nearly complete.
4. Lam Pra Plerng in Korat	Under construction, AID Loan 493-H-010.	Nearly complete.
5. Lam Takong in Korat	Under construction by RTG.	Completed.
6. Lam Nam Oon in Sakhon Nakhon		Under construction AID loan.
7. Upper Mun in Korat	Under AID-grant feasibility study.	Under construction.
8. Nam Yang in Roi-et	Under AID-grant feasibility study.	Not feasible.
9. Upper Chi in Chaiyaphum	Under AID-grant feasibility study.	Under construction.
10. Lam Dom Noi in Ubol	Under AID-grant feasibility study.	Under construction by NEA, canals by RID.
11. Huey Ka Yoong in Srisaket	Proposed for AID-loan feasibility study.	Planned for future construction.
12. Huey Hee in Nong Khai	Mekong Tributary Project for study.	Info. not available.
13. Lam Dom Yai in Ubol	Proposed for AID-loan feasibility study.	Planned for future construction.
14. Huey Tuey in Nakhon Phanom	Mekong Tributary Project for study.	Info. not available.
15. Nam Mong in Udorn	Mekong Tributary Project for study.	To be developed under Pa Mong.
16. Huey Bang Sai in Nakhon Phanom	Projected RTG-funded BUREC study.	Info. not available.

Changwad, however, makes the project of particular interest to AID because of the security sensitivity of the area and USOM's desire to support sound RTG projects in such localities.

The 1966 RID feasibility study of the Lam Nam Oon was reviewed by BUREC and their comments submitted to AID/W on February 20, 1967.

USOM Director Parsons requested on March 15, 1967 that the Assistant Administrator for East Asia delegate authority to USOM to prepare the "Intensive Review Request". (This request was made prior to the RTG's formal request for the loan). The delegation was made.

Also in March 1967, RID submitted the proposed loan application to NEDB. NEDB approved and submitted the proposal to the Cabinet on April 12, 1967. The Cabinet approved and the RTG made a formal application to USOM for an AID Loan on May 25, 1967.

USOM made the Intensive Review and USOM's Capital Assistance Committee drafted the Capital Assistance Paper.

This Capital Assistance Paper was reviewed and revised (with the concurrence of USOM) in AID/W. The final Capital Assistance Paper dated June 12, 1967 was presented to the Development Loan Staff Committee in Washington on June 16, 1967.

The loan was authorized June 21, 1967. Delegation of authority to sign the loan agreement was delegated to either the Ambassador or the USOM Director.

The loan was signed September 11, 1967 by the USOM Director and the RTG Minister of Finance.

B. THE LOAN LAM NAM OON IRRIGATION PROJECT.

The loan was not to exceed $3,500,000 to finance U.S. dollar costs of goods and services for the project. (The project will be described in Section IV of this report).

The interest rate was set at 3-1/2% payable semi-annually. (The rate of interest on prior Loan 493-H-010 was 3%). The term of the loan was 25 years with a five year grace period beginning from the first disbursement.

In this loan, as in most AID loans, there are conditions to be met by the borrower, called "conditions precedent" which must be satisfied prior to disbursement of the loan funds.

There are two sets of conditions. The first set must be fulfilled prior to any disbursement of funds and the second set prior to disbursement for anything other than engineering services.

The first set of conditions were to be met within three (3) months from the date of the agreement (September 11, 1967). The second set within fifteen (15) months.

The terminal dates were extended five times by implementation letters. The conditions precedent and the dates on which the conditions were deemed to have been met (in parenthesis) follows:

Conditions Precedent to Initial Disbursement. - (6/28/68)

(a) An opinion of the Minister of Justice of the Borrower or of other counsel acceptable to A.I.D. that this Agreement has been duly authorized or ratified by, and executed on behalf of, the Borrower, and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all of its terms. - (2/28/68)

(b) A statement of the names of the persons holding or acting in the office of the Borrower specified in Section 8.02, and a specimen signature of each person specified in such statement. - (2/28/68)

(c) Evidence of the completion, in accordance with Section 5.05 below, of arrangements with a U.S. engineering firm, acceptable to A.I.D., for engineering services for the Project, including services with respect to procurement of goods to be financed hereunder. - (6/8/68)

(d) Evidence that all local currency necessary for completion of the Project will be available as needed. - (2/28/68)

(e) Detailed approved plans submitted by Borrower for the resettlement of persons to be displaced by the Project, together with evidence of the timely availability of sufficient funds to carry them out. - (5/6/69)

(f) Detailed plans for the economic and agricultural development of the Project area through encouragement of modern irrigation methods and agricultural extension activities, together with evidence of the timely availability of sufficient funds to carry them out. - (5/28/69)

A letter from Director Hill to Minister Serm dated June 2, 1969 acknowledged the RTG's having met the conditions precedent.

A covenant in the loan requires that the borrower make available funds and other resources as "reasonably needed" to carry out the project including maintenance, repair, and operation.

Under Article V of the loan agreement (Procurement), reconditioned United States Owned Excess Property could be financed under the loan. To date no excess property has been made available that is "technically suitable for use in the project."

As usual in AID loans Section 8.03 provides for the issuance of implementation letters. This section is quoted:

(e) Evidence of plans for the establishment and maintenance by Borrower of physical security in the Project area adequate to assure scheduled completion of the Project. - (2/28/68)

Conditions Precedent to Disbursements for Other than Engineering Services. Prior to any disbursement or to the issuance of any Letter of Commitment under the Loan for any purpose other than to finance the engineering services referred to in Section 3.01, the Borrower shall, except as A.I.D. may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) A land classification report prepared as part of the engineering services financed hereunder. - (5/28/69)

(b) Complete final plans and specifications for construction of the Project, together with a suitable construction schedule. - (5/28/69)

(c) Evidence that arrangements have been made, in accordance with Section 5.05 below, for all procurement necessary for construction of the Project. - (5/26/69)

(d) Evidence that all necessary land and rights of way in the Project area, and permits for construction of the Project, have been obtained or arranged for. - (5/29/69)

"SECTION 8.03 Implementation Letters. A.I.D. shall from time to time issue Implementation Letters that will prescribe the procedures applicable hereunder in connection with the implementation of this agreement."

In the records relative to the loan negotiations it was noted that RID objected to signing a loan agreement and then being informed after the fact as to what it meant. The Director General's (of RID) fears were apparently allayed by a staff member from AID/W who explained that the same procedure was followed on the earlier loan without difficulty.

A summary of the Implementation Letters issued to date follows this page. The first letter details the requirements of the loan as well as procedures to follow in the implementation of loan. This first letter had eleven (11) pages and nine (9) attachments. Several of the attachments were AID Manual Orders. The letter and attachments include such details as reporting requirements, procurement regulations, and instructions for establishing letters of commitment and letters of credit.

IMPLEMENTATION LETTERS

Letter No.	Contents
1	Sept. 11, 1967 - Set forth procedures for using loan funds and provided information to assist the borrower in implementing the project in accordance with loan agreement.
2	Dec. 8, 1967 - Extension of time to January 31, 1968, to arrange for engineering services.
3	Jan. 31, 1968 - Extension of time to March 31, 1968, to arrange for engineering service.
4	Apr. 25, 1968 - Set forth reporting requirements.
5	June 7, 1968 - Extension of time to June 30, 1968, to arrange for engineering services.
6	Dec. 11, 1968 - Extension of time to April 30, 1969, to meet second set of conditions precedent.
7	Apr. 29, 1969 - Extension of time to May 31, 1969, to meet second set of conditions precedent.

III. ENGINEERING CONTRACT

A. REQUIREMENT FOR ENGINEERING SERVICES.

The 1966 Feasibility Study was considered adequate to establish the feasibility of the project. The necessity for upgrading the feasibility report by subsequent revisions was evidence of the need for additional technical input for the finalization of the project. The thorough critique of the feasibility study during the review process further indicated the need of assistance to the RID staff on this project.

The requirement for engineering services was therefore included in the loan agreement as a condition precedent prior to disbursement. (See Section 3.02 (c) of the Loan Agreement). The U.S. dollar costs of these services was eligible for financing under the loan.

Included in the second set of conditions precedent (Section 3.02 of the Loan Agreement) are several conditions which were expected to require the assistance of expatriate personnel. These were:

A land classification report.

Complete final plans and specifications for construction of the Project, together with a suitable construction schedule.

Arrangements for all procurement necessary for construction of the Project.

Detailed plans for the economic and agricultural development of the Project area through encouragement of modern irrigation methods and agricultural extension activities.

B. ENGINEER SELECTION AND NEGOTIATION.

Following the A.I.D. Capital Projects Guidelines for Borrower Procurement of Engineering and Other Professional Services of U.S. Source and Origin, an advertisement was placed in the Commerce Business Daily (November 3, 1967) inviting expressions of interest from engineering firms.

The following description of the scope of work was copied from the advertisement:

" The Royal Irrigation Department will perform the engineering design and other required engineering services within its capabilities and will perform the actual construction either by force account work or locally awarded contracts. However, it wishes to employ a qualified US engineering firm or joint venture to assist, guide, direct, or otherwise complement Royal Irrigation Department technical personnel as required to accomplish all

elements of the engineering work in an expeditious and professionally competent manner. The U.S. A&E will assume technical responsibility for all phases of project work normally that of the Engineer. The engineering responsibilities will include land classification and drainage studies, pre-construction design studies (including sediment determination, hydrology, sizing of earthfill storage dam, concrete spillway, lined and unlined canals and laterals), cost estimates, computation of benefit-cost ratios, development of design criteria, preliminary and final design, preparation of specifications, procurement of construction equipment and materials, engineering supervision of construction and comprehensive reporting on status and progress of project. Training of Royal Irrigation Department personnel in proper methods in all phases of the above work will be an important aspect of the work."

Eighteen (18) U.S. firms and one German firm responded. A nineteenth (19) response was received late but was not considered because of the failure to reach RID on time.

On January 12, 1968 RID advised USOM that they had sent the proposed scope of work and a description of the project to four of the firms.

By letter dated March 5, 1968, RID stated that they had received proposals from the four firms and listed them in order that they wished to negotiate. It should be noted that wo of the firms were placed low on the list because their estimates of the man months to accomplish the work were more than the others. Engineering Consultants Inc. was chosen first for negotiation by RID with this justification: "The Engineering Consultants, Inc. has had experience with the A.I.D. loan on three irrigation projects with the Department, and their works for these projects, Lam Pao, Kam Pra Plerng and Mae Tang are satisfactory to the Department."

Another letter in the file with the same date, same addressee, same signature, same RID file number and on the same subject gave the following justification: "The ECI is selected as first choice as their concept of the job and the total man-months with which it can be accomplished is most advantageous to us. In this connection the ECI has had experience in irrigation projects with RID and have performed satisfactorily,"

(It was interesting that one letter took 3 days to reach USOM and the other letter 8 days.)

RID in their letter of March 5 asked for early concurrence by AID so that RID would comply with the terminal date for meeting the conditions precedent. (The terminal date had been extended twice).

On March 29 RID submitted to USOM a draft of the proposed engineering contract a detailed cost summary, and bio-data of the ECI and requested approval. The draft was accepted as being satisfactory March 30, 1968.

The contract yet had to be approved by the RTG Cabinet prior to execution by RID. The contract was signed on June 14, 1968.

C. CONTRACT BETWEEN ECI AND RID.

The contract signed on June 14, 1968 was a cost plus a fixed fee contract. The estimated cost was $407,000 with a fixed fee $40,500 for a total estimated cost of $447,500. The contract states that these figures include the equivalent of all local costs, however an estimate sheet in the FY 68 file dated 5/27/68 shows the $407,000 as dollar costs and also lists baht costs as an additional ฿ 590,000.

Although the contract does not give an estimate of the man-months the estimate sheet shows 127 man months overseas and 43 in the home office. The contract has a $50,000 limitation as to the total for home office salaries.

The contract was to cover a period of 45 months after the notice to proceed was given. The notice was given on September 27, 1968. It is already evident that the construction period will extend beyond

that time. The contract provides for a reduction in fee of $200 per month if the work is accomplished in less than 42 months and a negotiation for a change in fee if the engineer's work exceeds 48 months.

The scope of work is in general the same as that given in the preceeding section on "Engineering Selection and Negotiation". The complete contract is on file in USOM.

At the present time ECI has three (3) men in Thailand assigned to the Project.

IV. THE LAM NAM OON IRRIGATION AND FLOOD CONTROL PROJECT

A. PROJECT DESCRIPTION.

- Location -

This project area is in Northeast Thailand in Changwat (Province) Sakon Nakhon. The dam site and much of the irrigable land is in Amphoe (District) Phanna Nikhom. A drawing of the project area is at the end of this section.

For reference purposes the following information as to location is given here.

The dam site is at Latitude 17°19'N and Longitude 103°45'E. The left abutment of the dam is at the village of Ban Nong Bua which may be located by coordinates 366000 - 1914000 on Army Map Service 1:50,000 Series L 708 sheet 5762 IV.

To reach the site by road one must turn south at kilometer mark 105 off the Udorn-Sakon Nakhon highway (about 45 kilometers west of Sakon Nakhon). It is then about 6 kilometers on a provincial road to the village of Ban Huey Sala where the access road begins then eastward to Ban Nong Bua Village at the dam site.

Some of the canals cross the main highway. These canals have roads parallel to them which provide access to the dam site.

- Dam -

The dam will be an earthfill dam approximately 3,000 meters long with a maximum height of 30 meters. The maximum section at the bottom will be 200 meters in width. The crest of the dam will be at an elevation of 190 meters above mean sea level. The spillway crest will be at elevation 185 meters. The top width will be 8 meters.

The side slope will be 3:1 on the upstream face and 2-1/2:1 on the downstream. There will be riprap protection above and below the water surface for protection from wave action.

A service spillway and river outlet is provided to maintain a flow in the river downstream and to provide a mean of releasing excess water from the reservoir. This is designed as a reinforced concrete Morning Glory type with a crest diameter of 15 meters. The conduit through the dam is 6 meters in diameter. The spillway is designed to discharge 350 cubic meters per second with a reservoir elevation 2.5 meters above the spillway crest.

An emergency spillway has been provided as additional protection against emergency situations. Insufficient data was available to predict the probable maximum precipitation or the maximum expected flow from a 1,000 year flood. For the design flood for the spillway a tropical storm was transposed and maximized. Tropical storm "Tilda" of September 22-23, 1964 was used. "Tilda" was one of the largest storms of record in northeast Thailand.

This emergency spillway is located in a natural saddle approximately 2.5 kilometers southeast of the dam (at maximum section). This spillway is 200 meters wide and will be ripraped for erosion protection. The crest of the emergency spillway will be at elevation 187.5 meters.

- Reservoir -

The information on the reservoir is summarized as follows:

Watershed area	1,100 sq. km.
Average rainfall	1,400 mm.
Maximum inflow design flood	2,100 c.m.s.
Reservoir area at + 185.00 MSL	85 sq.km.
Total capacity	520,000,000 cu.m.
Dead storage at + 175.00 MSL	45,000,000 cu.m.
Available capacity	475,000,000 cu.m.
Annual average inflow	365,000,000 cu.m.
Evaporation loss-annual	60,000,000 cu.m.
Reservoir bed level	+ 168 MSL
River bed	+ 160.5 MSL

Sediment deposition has been computed for both 50 and 100 years, and the results have been utilized in determining the water available for irrigation.

The reservoir will provide direct flood control benefits. The 1966 study did state that an average of 10.9% of the farm area was lost during the period 1951 to 1960. The benefits were included as estimated increased crop yields but benefits accruing from reduced damages to communication and transportation lines were not computed.

- Water Quality -

The quality of the water used for irrigation is important as crop production can be drastically reduced by the presence of harmful impurities on the lack of required constituents. The results of a water quality test indicate the water quality of the Lam Nam Oon can be classified as C1-S1 which means it has excellent quality for irrigation. The test was conducted in November when the flows are high and the effects of the monsoon leaching may affect the test results, the volume of this runoff would more than be sufficient to dilute any increased concentrations of sodium or chloride that might occur later in the dry season or early in the wet season. The preliminary land classification report did not indicate any leaching requirements for the project that would affect project water requirements. Any initial leaching required in project implementation would not affect long term reservoir operations as this would be accomplished prior to full development of the project.

The Royal Irrigation Department has adopted a policy of using concrete linings on all main canals and laterals in all new irrigation projects. The high initial construction costs are offset by reductions in seepage losses, lower annual maintenance costs, reduction in drainage system costs, and elimination of bank erosion, particularly that caused by water buffalo.

a. Left Main Canal and Laterals.

The left main canal is a concrete lined trapezoidal channel, twenty seven kilometers in length. The canal cross section is designed for a maximum flow of 9.07 cms. at the upstream end and decreases downstream as the flow is diminished by deliveries into laterals. The canal alignment was selected on the basis of insuring delivery of water to the laterals and maintaining an economical balanced section. One pumping plant and five drop structures have been incorporated in the left main canal design.

The canal is to be laid on a slope of 1:4000 through its entire length. Canal side slopes of 1-1/2:1 are adequate for the existing soils in the area. Weep holes will be provided, as required, to relieve excessive soil pressures which could otherwise develop behind the lining. A profile of the left main canal is shown on Drawing No. LO-650.

The laterals of the left main canal are concrete lined trapezoidal channels of varying cross section commensurate with their individual design flows. Flow in the three laterals on the right side of the main

canal will be by gravity. Pumping plants will be required on four of the five left side laterals. Two additional pumping plants will be used to relift water on two of the larger laterals. The total irrigable area supplied by the left main canal and its 44 kilometers of laterals and sub-laterals is approximately 60,000 rai.

b. Right Main Canal and Laterals.

The design features of the right main canal are, in most respects, identical to those of the left main canal. The main difference is in the greater cross sectional area which is required to accommodate a maximum flow, at the upstream end, of 21.15 cms. The canal will be laid on a slope of 1:8000. No pumping is required on the 43.2 kilometer right main canal.

The laterals of the right main canal are concrete lined trapezoidal channels sized in accordance with their respective design flows. There are no laterals on the right side and flow into all laterals on the left side will be by gravity. Two pumps will be required on the laterals. The total irrigable area supplied by the right main canal and its 155 kilometers of laterals and sub-laterals is approximately 140,000 rai.

B. COSTS AND BENEFITS.

- Costs -

The total construction cost estimate for the Lam Nam Oon Irrigation Project is 438,500,000 Baht, 367,000,000 of which is local currency to be used for wages, construction equipment and materials which are available locally. The remaining 71,500,000 Baht is allocated for the purchase of foreign construction equipment equipment and engineering services, with foreign currency.

The project was originally planned for construction in two stages. Stage I consisted of the reservoir, dam and headworks, left main canal and lateral system and 26.5 kilometers of right main canal with lateral system. Stage II consisted of a 17 kilometer extension on the right main canal along with laterals and farm distribution system.

Throughout this report the project has been considered as only one stage, combining stages I and II of the former proposal. The construction cost estimate, which follows, is also based on single stage construction. If the project were to be built in two stages, however, the approximate costs of stages I and II would be approximately 384,500,000 Baht and 54,000,000 Baht respectively. Stage I contains an irrigable area of 133,630 rai and Stage II contains an irrigable area of 69,710 rai.

Construction Cost Summary

	Total Cost 1000 Baht
Preparation Work	24,060
Dam	54,079
Dike and Emergency Spillway	585
Service Spillway	14,597
Left Main Canal Head Regulator	1,308
Right Main Canal Head Regulator	2,127
Canals and Laterals	165,284
Farm Distribution System	15,715
Drain Channel Improvement	18,135
Small Hand Tools	10,010
Construction Equipment	61,000
Foreign Consultant	10,500
RID Administration and Supervision	6,000
Subtotal	383,400
Contingencies	55,100
Grand Total	฿ 438,500

Annual Construction Costs Estimates

Fiscal Year	Foreign (1000 Baht)	Local (1000 Baht)	Total (1000 Baht)
1967 (2510)	-	6,400	6,400
1968 (2511)	-	21,000	21,000
1969 (2512)	2,000	28,000	30,000
1970 (2513)	57,000	44,000	101,000
1971 (2514)	9,500	120,000	129,500
1972 (2515)	2,000	120,000	122,000
1973 (2516)	1,000	27,600	28,600
	71,500	367,000	438,500

- Benefits -

Since the Lam Nam Oon Irrigation Project is primarily for irrigation, the main direct benefits expected are from increases in production of crops. Some direct benefits will result from flood control, improvement in domestic water supply, roads, reservoir fish, and reservoir recreation, but although each of these is significant, in total they are relatively small compared to benefits from increased crop production.

In general, the crops selected for the project are those known to be climatically adapted to the area and those with which farmers already have experience in producing. Also, the crops selected are expected to have a continuing and increasing demand, either for domestic use or for export, or for both.

The total net irrigable area for the project is 203,340 rai as determined by preliminary land classification survey. Based on preliminary land classification 188,325 rai would be suitable for double cropping but the availability of water will limit dry season crops to 105,630 rai. The water supply from the Lam Nam Oon basin is not sufficient for full cropping of the area by irrigation during the dry season. Crop Plan A was based on the anticipated water supply development. Since there has been some consideration given to the future importation of water, Crop Plan B based on full water supply development was also developed. Although Crop Plan B is only hypothetical, its presentation will show the potential benefits that could be derived if supplemental water, possibly from the proposed Pa Mong Project or from weather modification programs, becomes a reality. The total land area to be irrigated is the same for both plans. The basis difference between them is in the extent of multiple cropping. Application of intensive levels of modern crop production methods along with use of improved adapted varieties no doubt would result in marked increases in production.

LAM NAM OON IRRIGATION PROJECT
CROPPING PATTERN FOR WATER REQUIREMENT
(Rai)

Crop	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Rice												
Field preparation	500	30,420	77,350	5,160				12,500	12,500			
Nursery	165	1,860	5,170	345				1,110	1,100			
Field crop	750	830	52,550	104,630	113,230	103,790	9,435		16,670	25,000	25,000	20,310
2. Sugarcane	14,980	15,630	15,630	15,630	15,630	15,630	15,630	15,630	13,025	8,465	7,815	10,420
3. Dry crop B/A		3,500	3,500	7,000	7,000	7,000	7,000	7,000	7,000	6,125	875	
4. Dry crop A/B	900	21,500	21,500	43,000	43,000	32,250	10,750	2,700	34,990	45,000	45,000	29,370
5. Truck crops	10,000	14,480	14,480	14,480	14,480	14,480	14,480	10,000	10,000	10,000	10,000	10,000
6. Fruit	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

It was assumed that marketing facilities and demand will develop concurrently with production increases as the project develops.

Production cost figures consisted of costs for seed, plus additional estimated cash costs of production. They do not include labor or managerial cost, interest, or equipment depreciation.

Each of the benefit variables is considered to be reasonably evaluated. However, plus or minus errors no doubt exist for each variable estimated. Many of these can be expected to be compensating, but to provide for the chance accumulation of errors such as to result in somewhat lower total benefits than expected, an annual benefit contingency (reduction) of 30% is applied.

The following annual equivalent benefits are those resulting from the calculations and include benefit contingency reductions.

- Total Annual Cost of Project -

Construction Cost	Ƀ	438,500,000
Interest during Construction, Local		74,472,000
Foreign		8,252,000
Total	Ƀ	521,224,000

Annual equivalent cost: 50 years at 6% interest

Capital Recovery Factor: .06344

521,224,000 x .06344	=	33,066,000
O & M cost at 25 Baht/rai		
203,000 x 25	=	5,075,000
Equipment replacement	=	500,000
Pumping Cost 1/	=	1,830,000
Total Annual Equivalent Cost		฿ 40,471,000

- Benefit Cost Ratio -

Annual Equivalent Benefit: ฿ 90.3 Million

Annual Equivalent Cost: ฿ 40.5 Million

Benefit Cost Ratio = $\frac{90,300,000}{40,500,000}$ = 2.23:1

1/ Pumping Cost Data:

38% of total irrigation demand will be pumped

Average pump lift - 5 meters

Pump and motor efficiency - 85%

Cost per kilowatt hour - 1 Baht

- Other Direct Benefits -

Direct benefits from flood control, improvement in domestic water supply, roads, reservoir fish, and reservoir recreation will result following project construction. However, no evaluation is attempted of these benefits for this project, partly because of the lack of reliable bases and partly because the total is expected to be small relative to benefits from increased crop production.

- Indirect Benefits -

The indirect benefits derived from an irrigation project such as this can be divided into local and national categories. A tabulation of the most commonly considered is given below:

Local	National
Increased manpower needs	Increased tax receipts
Increased local tax receipts	Increased national agriculture
Increased transportation industry	Production and potential export
Increased local industry	Increased transportation industry
Expanded local retail market	Increased national agri-industry
Improved economic and social development of populace	Improved economic and social development of populace

A numerical value is difficult to affix for these indirect or secondary benefits most are either dependent upon factors beyond the scope of this report or are not by measurable in monetary terms.

The increased manpower requirements both locally and for the nation will be a decided boon as the present manpower utilization is quite low. The local and national tax revenue increases will be sizable, but with future changes in the tax structure it cannot be reliably estimated. The increases in local and national agri-industry and general services will generate further employment and business.

C. CONSTRUCTION SCHEDULE

The most significant single aspect to be considered in preparing a construction schedule for the Lam Nam Oon Dam is the delivery date of the new equipment. The procurement of this equipment was expected to conform to the following schedule:

Invitation to Bid advertise	December, 1969
Bids opened	February, 1970
Supply contracts awarded	April, 1970
Equipment arrives at jobsite	September, 1970

On the basis of new equipment arrival at the job site in mid September, 1970 ECI had the following schedule:

September 1, 1969 to September 30, 1970
Old equipment working
Assume 27,000 c.m. per month
27,000 x 13 months = 350,000 c.m.

October 1, 1970 to November 1, 1971
Old and new equipment working
Assume 60,000 c.m. per month for five wet months
Assume 200,000 c.m. per month for eight dry months
60,000 x 5 months = 300,000 c.m.
200,000 x 8 months = 1,600,000 c.m.

Total in place to November 1, 1971 2,250,000 c.m.

November 1971
River Diversion through spillway conduit

November 1971 to May 1, 1972
Old and new equipment working
Complete dam embankment

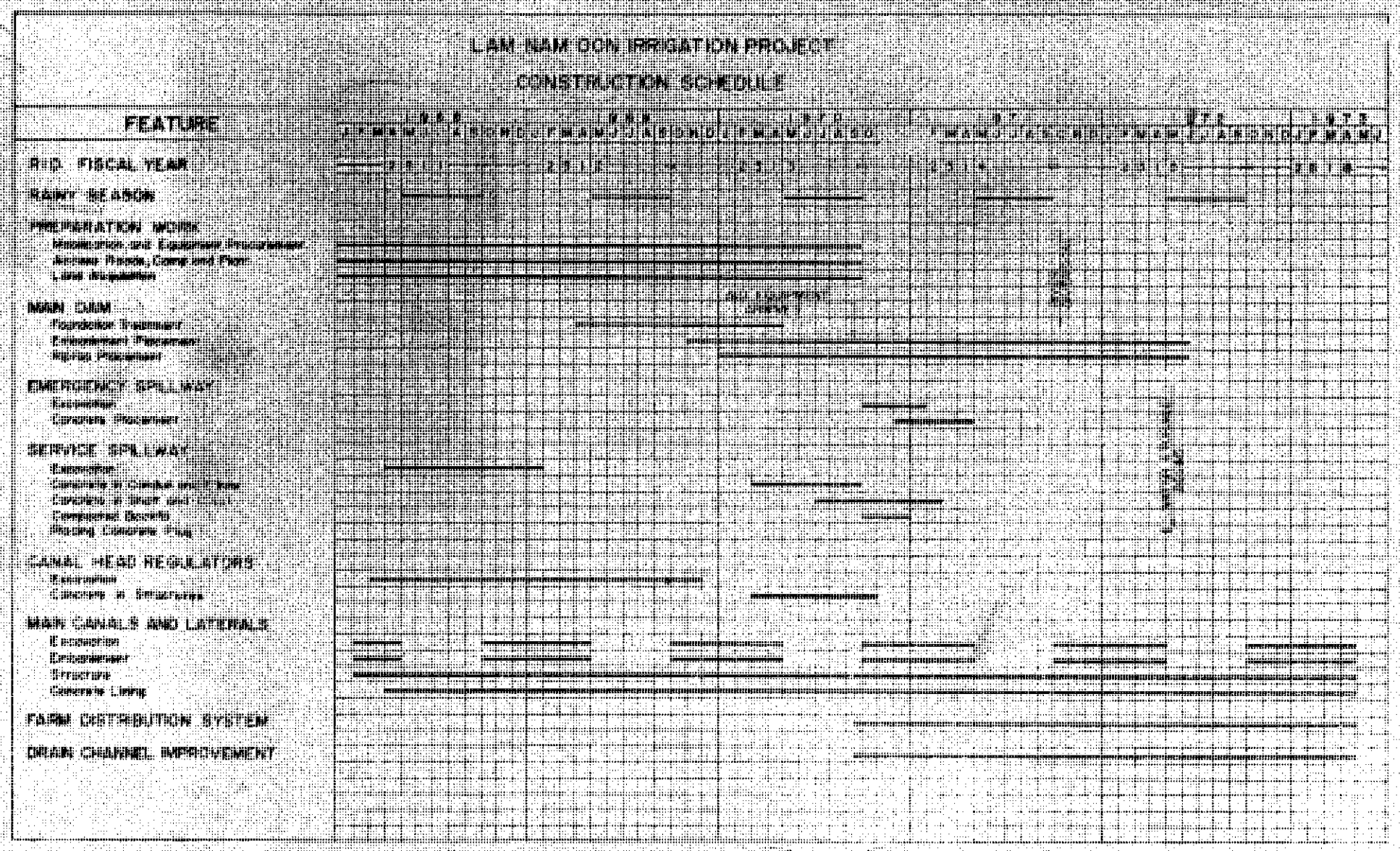
May 1, 1972
Place plug in spillway and begin storage of water

June 1972
Dam construction completed

The arrival of the equipment at the job site will be about September 1971. One year should be added to ECI's estimate and to the schedule on the following page.

LAM NAM OON IRRIGATION PROJECT

CONSTRUCTION SCHEDULE



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D. PROGRESS AS OF:

	1/31/70	5/30/70
Engineering ECI	26.06%	35.19%
RID	30.75%	39.94%
Construction	16.45%	19.07%
Procurement	0.00%	0.00%
Contingency	0.00%	0.00%
Overall	12.15%	14.19%

Activity will continue at a slow pace until equipment being procured with the loan funds arrives on site. This will probably be during the first half of CY 71.

V. RESETTLEMENT

A. THE PROBLEM AND ITS IMPORTANCE.

Experience with other irrigation projects, and in particular the Lam Pao Project, has focused attention on the need of better planning and implementation on the part of the RTG in the relocation of families displaced by new reservoirs.

With the present political climate, insurgents are quick to capitalize on any dissatisfaction or the most minor action which could be misconstrued as an injustice.

Legal procedures are in existence and used to procure the land. July buying the land at a fair price or even higher than fair value does not always offer sufficient appeal to placate long time residents. Often other land is not available and farmers do not like to move. The problem is often made much more difficult when it is discovered that farmer is a squatter and has no legal right to the land which he may have occupied for years. In this case the RTG has no legal basis to make payment.

USOM has included in the conditions precedent a requirement for an acceptable resettlement plan and assurances that the plan will be implemented.

A major obstacle in the resettlement program is that; RID is the RTG's implementing agent for this loan but the Department of Public Welfare is responsible for the resettlement.

USOM has pushed for improved coordination between RID and the Department of Public Welfare and also between other departments which could assist and improve the resettlement effort.

B. THE PLAN.

A "Project to Establish a Self-Help Land Settlement at Lam Nam Oon in Sakon Nakhon Province in Consequence of Evacuating the Areas to be Flooded in Creating the Lam Nam Oon Irrigation Project" was prepared by the Department of Public Welfare, Ministry of Interior.

The plan for this proposed project was accepted as meeting the condition precedent on resettlement. The people and property to be provided for by this project is as follows: 1500 families, 9 temples, 10 schools, 10,420 rai of farms and homelots.

The chart on the following page outlines the assistance to be given by departments other than the Department of Public Welfare. It is evident that a project of this complexity requires a broad range of technical expertise.

Total land made available for resettlement is 36,394 rai. 7,319 rai will be reserved for forest, 2,000 rai for the resettlement office and future use, and 1,800 rai for a small reservoir. The remainder will be reserved for 17 villages.

The project is based on a "Village Plan" system, each village is to have 74 families, and each family 15 rai of land. See the plan of the layout following this page. Of the 15 rai 2 rai will be for a homelot and the balance for farming. The 2 rai for the house and 3 rai of the farm land is to be cleared, however, the remainder is to be cleared by the individual.

C. PROGRESS TO DATE.

The resettlement office has been constructed as have roads, office, and a village meeting hall. A full time administrative staff is at the site.

Few families have moved yet and the movement will undoubtedly go slowly until they are forced to move by rising water which will be at least two more years.

D. RESETTLEMENT ACTIVITIES

ROYAL IRRIGATION DEPARTMENT

HYDROLOGICAL SURVEY

IRRIGATION PROJECT

ACCELERATED RURAL DEVELOPMENT

12 KM OF ROAD (SURVEY BY R.I.D.)

LAND DEVELOPMENT DEPARTMENT

SOIL SURVEY

PROVINCIAL GOVERNMENT

TRANSFER OF SCHOOLS

AGRICULTURAL EXTENSION

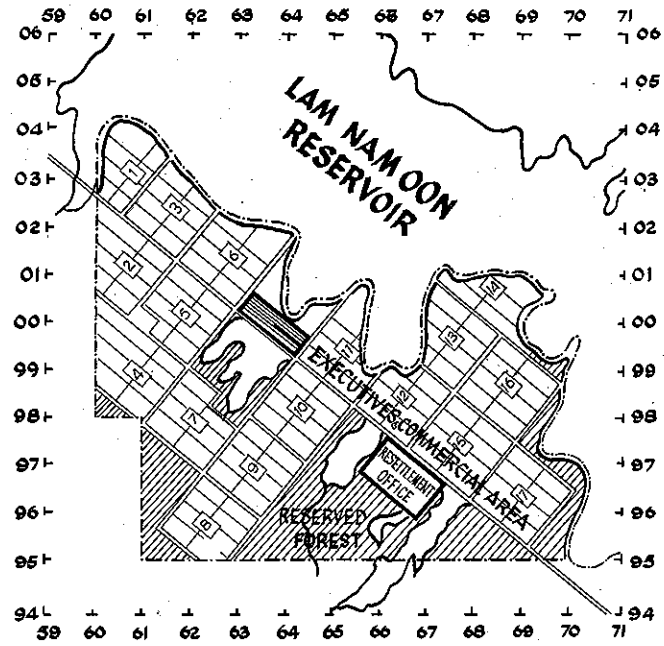
PUBLIC WELFARE DEPARTMENT

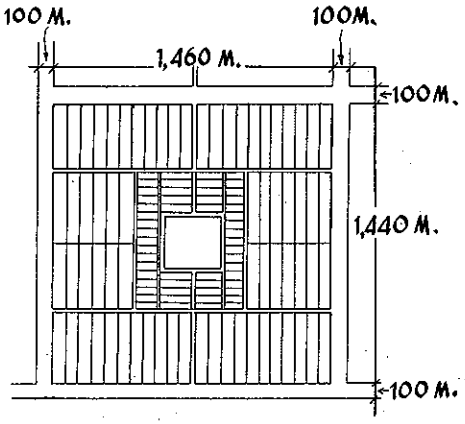
ESTABLISHMENT AND ADMINISTRATION OF NEW SETTLEMENT

SERVICES AND FACILITIES TO BE PROVIDED

SCHOOLS	TEMPLE
CLINIC	MARKET
WELLS	AG. EXTENSION
	ADMIN. STAFF

LAM NAM OON RESETTLEMENT PROJECT





LAND PROVIDED FOR MEMBERS OF LAM NAM OON RESETTLEMENT

Standard plan for 74 families
15 rai per one family
13 rai for farming
and 2 rai for housing

VI. SECURITY

A. LOAN REQUIREMENT.

The security situation is a problem in and around the project area. Special attention has been given to this aspect. Plans had to be developed to insure that the project could be implemented. This was required by the loan agreement. Meetings were held with the responsible RTG departments and USOM was represented by the Office of Public Safety. Security plans were developed as a result of this effort. Additional police stations have been established in the area of the construction site and security arrangements were made which appear to be satisfactory.

B. PRESENT SECURITY SITUATION

At the time of the last on-site inspection in June 1970 there had been no incidents reported involving the project. Enroute to the site one passes by a new police station but there is no evidence of military presence. During this same inspection there was one guard with an automatic weapon who accompanied our party in the immediate area of the dam site. On a trip through the reservoir area and to resettlement area an escort of 9 men equipped with automatic weapons was provided. There was no evidence of hostility in passing through the reservoir area. As to the resettlement site the government officials reside there and there was no evidence of any security precaution.

CT does not stand for Communist Thai, but rather for Communist Terrorists who may or may not be ethnic Thai

C. COMMENTS ON SECURITY.

Early in the project it was determined that a ~~Communist Thai~~ (CT) maintained their headquarters somewhere within the reservoir area. When the reservoir is filled the CT headquarters will be inundated. The population in this area will have to be relocated to the resettlement villages or move elsewhere of their own volitian. This should be a plus factor toward government protection of the population from insurgent subversion.

VII. PROCUREMENT

A. EQUIPMENT LIST.

Early in the project, a list of needed equipment to be procured under this loan was prepared. This list of equipment follows this chapter.

B. SPECIFICATION.

The invitations for bid (IFB) and technical specifications were submitted to AID/W for approval in 1969. This approval was granted after some changes were made in the IFB. The specifications were prepared for 6 bid packages.

C. BIDS.

Bids were received in February 1970. A letter of commitment had been established in the amount of $2,754,000. The bids received were as follows:

LNO-1-1	Major Earthmoving Equipment	$1,836,571.74
LNO-1-2	Trucks	170,453.00
LNO-1-3	Draglines	465,435.50
LNO-1-4	Generators and Welders	73,957.94
LNO-1-5	Compressor, Air Tools & Concrete Mixers	97,167.56
LNO-1-6	Shop Tools and Equipment	6,634.69
		$2,650,220.43

The bids also included a provision for 10% spare parts which are not included in the above bid prices. The balance after purchase of equipment in the letter of commitment would be $103,797.57 which is less than 4% available for spare parts.

D. PRESENT STATUS (As of August 15, 1970).

No contracts have been awarded for equipment.

LNO-1-1 - In the mail between RID & USOM

LNO-1-2 - AID/W approved 8/14/70

LNO-1-3 - AID/W advises draglines be rebid.

LNO-1-4 - Awaiting response from AID/W

LNO-1-5 - In the mail between RID & USOM

LNO-1-6 - In the mail between RID & USOM

EQUIPMENT LIST

Bid	Quantity	Type
LNO-1-1	5	270 H. P. Bulldozer with blade
	2	270 H. P. Bulldozer with blade and ripper
	4	180 H. P. Bulldozer with blade
	1	180 H. P. Bulldozer with blade and ripper
	8	20 Cu. yd. Motor Scaper
	6	9 Cu. yd. Motor Scaper
	5	115 H. P. Motor Grader
	1	2 1/2 Cu. yd. Front End Loader
	2	Double Drum Sheepsfoot Roller
	1	Self-propelled Rubber Tired Roller
	10	10 Cu. yd. Rear Dump Truck (6 x 4)
LNO-1-2	10	21,000 Pounds G. V. W. Utility Trucks (4 x 2)
	6	21,000 Pounds G. V. W. Trucks (4 x 2) with Dump Platform
	1	4 Ton Fork Lift Truck
	7	3,900 Pounds G. V. W. Field Vehicle (4 x 4)
LNO-1-3	5	1 1/2 Cu. yd. Diesel Crawler Dragline with two (2) sets of Heavy Duty Shovel attachments
LNO-1-4	2	100 KW Diesel Generating Set
	2	60 KW Diesel Generating Set
	5	5 KW Diesel Generating Set
	5	300 Amp. Gasoline Engine Generator D-C Arc Welder
	1	500 Amp. Semi Automatic Motor Generator Welding Set, A-C
LNO-1-5	2	600 CFM Air Compressor
	2	250 CFM Air Compressor
	1	Wagon Drill
	2	Crawler Rock Drill
	1	Motor Driven Concrete Mixer (21 cu. ft.)
	2	Concrete Mixer (11 cu. ft.)
LNO-1-6	1	14-inch Shaper
	2	8-inch Electric Bench Grinder
	1	10-inch Engine Lathe
	1	16-inch Engine Lathe
	1	10" x 1" Double Wheel Pedestal Grinder
	1	1 1/4-inch Sensitive Drilling Machine
	1	16-inch Wood Planer
	1	12-inch Circular Saw
	1	12-inch Hacksawing Machine
	1	75-Ton Hydraulic Press

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VIII. POSITIVE RESULTS EXPECTED FROM PROJECT

A. LABOR INTENSIVE.

The loan provides for purchase of modern construction equipment, however, large numbers of labor and craftsman are also required. At the present time there are approximately 800 employees on the project. This provides gainful employment in many of the people in the reservoir area. The result is equivalent to new industry operating in the area for several years. Judging from the other irrigation projects similar in size total employment on the Lam Nam Oon may reach as high as 4,000 as the project activities increase.

B. VISIBLE END PRODUCT.

This project is physically visible to great numbers of people who pass the highway between Udorn and Sakon Nakhon along and through most of the benefited area. The benefits of the project should be readily apparent to those passing by, much the same as the abandant agriculture production which can be viewed from the Bangkok-Saraburi highway resulting from the development of the Chao Phya River Basin.

C. LONG TERM INCREASING BENEFITS.

This project should produce benefits beyond the life expectantcy of any one now living. With the guarantee of an adequate water supply farmers should be able to maximize

the benefits of improved seeds, fertilizer, and insecticides. The operation and maintenance costs of this system should be quite low with the concrete lined canals and laterals.

The Planning Division of the Royal Irrigation Department prepared a report "Economic and Agricultural Development Lam Nam Oon Irrigation Project" to satisfy Section 3.02.f of the conditions precedent of the loan agreement.

This report outlines the status of Farm Credit, Land Tenure and Ownership. Processing of Farm Products, Marketing, Water Users Associations, Farm Management, and Research and Extension Service.

Future plans are for the RID to assist the farmers to organize into Irrigation Water Users Associations. An Association is to be established in each zone. (One zone will not exceed 10,000 rai). One Ditch Rider will be assigned to each zone. There are to be at least 17 irrigation water users associations.

Assistance will be given in farm layout, construction of dikes and ditches, irrigation practice, soil improvement, and crop diversification.

The Ditch Rider will be paid by RID. RID will also pay for operating and maintenance costs of the main system.

IX. REPORTS AND MONITORING

A. MONTHLY REPORTS.

The borrower (RID) is required to make monthly progress reports (Implementation Letter No. 4) which are reviewed by USOM and copies forwarded to AID/W and distribution made within USOM. These reports are to give the status of heavy equipment engineering and construction on the project, and also include financial data on expenditures of the project. These are prepared in accordance with AID Engineering Guideline No. 2. A final report will be required at the completion of the project.

B. ON SITE INSPECTION REPORTS.

AID Manual Orders require every six months an "on-site inspection" which usually made by the engineer and the loan officer. These reports are prepared in accordance with outline in manual orders.

C. SHIPPING REPORTS.

RID is required to make quarterly reports of all shipment received and the nationality of ship which is used to transport the shipment. This is required in order to determine that 50% of the shipment must be made by U.S. flag vessels and to further insure that no ships are used, that have transported cargo to North Vietnam.

X. PROBLEMS AND RECOMMENDATIONS

A. MAINTENANCE AND EQUIPMENT DOWNTIME.

The engineering contract provides for a master mechanic to assist RID. As the equipment being procured under this loan has not been contracted for delivery the mechanic has not arrived.

Spare parts and the resulting downtime of equipment appears to be a problem widespread in Thailand construction projects. Parts which are stocked by RID can be obtained easily and quickly. Parts which are not stocked but which can be purchased in country requires approvals which usually takes three (3) months. Parts which must be ordered from abroad take as long as one year.

The procedure to obtain spare parts should streamlined throughout the RTG. In this particular case USOM should explore the possibility of an open-end PIO/C for parts procurement. This should alleviate the problem on this project. With the limited amount of money available for spares it would be prudent to order only as needed all spares other than scheduled replacement parts such as filters, spark plugs, and a limited list of fast wearing spare parts.

B. BENEFITED USER SHARING COST.

Some of the earliest recommendations by foreign experts, (at least and far back as the FAO report of 1948) recommended that those farmers benefited by irrigation projects share in the costs. In the past, the national government justified investment in irrigation project on the basis that all farmers had a subsistence level of production and that any excess production as a result of irrigation would be available for exports on which the national government would receive an export premium. Thus indirectly receiving a return from the investment in the project.

With the present uncertainty in world production and market price of rice it is questionable whether this reasoning is still valid.

C. CONTRACT WORK

Until recent years all government work was done by force account directed by government employees. The first significant break through contract work was that of the Highway Department. There has been a tremendous increase in the completion of work accomplished and also in the development of Thai contractor capability. RID has had a limited amount of contract work and this was not entirely successful due to lack of experience of RID employees in contract management

and contractors. This should not discourage RID from expanding ~~of inexperienced~~ their efforts to do work by contract. RID has approximately 80,000 employees which is an extremely large management problem. Projects could probably be more efficiently accomplish their work with contract forces.

D. SLOW IMPLEMENTATION.

All governments are of course politically motivated and to demonstrate their interests in the country geographically they often attempt to begin a project prior to the development of adequate plans. Project planning should be adequately prepared to implement the project in an expenditious manner. This project could undoubtedly be completed in half the time now anticipated. There are certainly economic savings in terms of interest on the investment being made without receiving the corresponding benefits for a long time. There would also be other savings in administrative cost and a reduction of technical talent which is now being spread over the longer contract period.

E. RTG/RID - USOM/AID ACTION.

As evident in this report there is an unreasonable amount of time consumed in bureaucratic action on the part of both the U.S. government and the RTG. The difficulty to press the Thai government to employ ~~and~~ improved processes when their bureaucratic procedures are no less cumberson than that of the U.S. government and its agencies.