7/2/79 [1]

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ok at 4:15 pm

THE WHITE HOUSE

WASHINGTON

July 2, 1979

MEMORANDUM FOR THE PRESIDENT

FROM: JACK WATSON Jack

SUBJECT: Conference Call With Governors Carey, Byrne and Grasso -- Monday, July 2, 1979

Hugh Carey just requested a brief conference call between you, Governors Carey, Byrne and Grasso this afternoon. As you know, the Northeast has suffered massive gas lines and shortages this past two weeks.

Because you saw Governor Brown when the gas lines appeared in California, and because I have assurances that this call from the three Northeastern Governors will be a constructive one, I recommend you do the call. Stu joins me in the recommendation.

If you do this call, the Governors will open the discussion by reporting to you on the overall situation as this new week begins (our information suggests marginal improvement). They will also report that they have used the three emergency powers you delegated to Governors:

-- installation of odd-even systems;

-- imposition of minimum purchase requirement;

-- requirement of staggered hours of operation for some gas stations.

The Governors will ask for a review of the basic gasoline allocation system to ensure that it is not discriminatory to the Northeast (they believe that it is). In addition, they will ask that a review be made to insure that intra-state allocations not work to the disadvantage of the older and larger cities within their states.

As you know, on May 1st, DoE changed its allocation formula to reflect changes in demand attributable to growth and expansion in some areas of the country. Some Governors

are concerned that this approach may create some distortions in the system that adversely affect cities.

You can and should say the following in response to the Governors:

(1) Express your personal concern over the gasoline shortages and the inconvenience and hardship imposed on many people in their States.

(2) Note that you have established a Task Force under my chairmanship to work with Governors and others to ensure that we are managing the energy shortages as effectively as possible.

(3) Acknowledge that the allocation system is necessarily an evolving one, and that DoE is reviewing the system now to minimize the kinds of possible distortions that concern the Governors.

(4) Remind the Governors of the importance of their States' set-aside (5% of the monthly allocation to each State) for short-term intra-state shortage problems.

(5) Tell them you have asked me to work closely with the DoE to ensure that our assessments and actions in this area are handled expeditiously.

All three Governors are anxious to have this conversation with you (they originally asked for a meeting), and all three believe it would be a good way for you to demonstrate your attention to and concern for the situation in the Northeast.

THE WHITE HOUSE

WASHINGTON

July 2, 1979

MEMORANDUM FOR THE PRESIDENT

FROM: JACK WATSON

SUBJECT: Statement for Your Conversation with Governors Carey, Byrne, and Grasso.

You can make the following statement in your conversation with the Governors:

- DoE has today issued a regulation which clarifies the authority which refiners already have to redirect up to 5% of their gasoline supplies to States or areas experiencing energy shortages.

- Refiners already have this authority, but in the absence of this clarifying regulation were afraid to redirect this supply for fear of being in violation of federal allocation rules. This regulation, while not increasing the total available supply of gasoline, should clear the way for refiners to be better able to respond to shortages.

- There will be a more efficient matching of available gasoline supplies with areas of greatest demand.

2:30 PM

THE WHITE HOUSE

WASHINGTON

July 2, 1979

MEMORANDUM FOR THE PRESIDENT

FROM: JACK WATSON Jack

SUBJECT: Meeting with Management Task Force on Energy Shortages - Monday, July 2, 1979 at 2:30 p.m. (Roosevelt Room)

You will be meeting with your newly-established Management Task Force on Energy Shortages for 30 minutes. The following people will attend:

Indep. Truckers → work

Jim Schlesinger	Diesel fuel supply eased - out 9 weeks
John O'Leary	5% state set-aside
Al Alm	
Dave Bardin	
Barton House	
Lynn Coleman	Energy
Jack Fearnsides	Truck stops → normal
Alan Butchman	Transportation
Dan O'Neal	Carriers → normal
Ernie Olson	ICC
Ben Civiletti	Diesel 85% max avg 85%
Don Flexner	Incidences ↓ 130/26 injury → ok now
Jim Williams	Justice
Weldon Barton	- fresh products now moving = fresher
	Agriculture
Barbara Blum	
Bill Drayton	EPA
John Macey	FEMA

meat/poultry → normal
① Grain elev + RR + barge ② Set aside < 8/15 ③ from fuel needs
+14% to/wk moving 7% ag

There will be a photo session for the press during the opening two to three minutes of the meeting.

I suggest the following agenda for the meeting:

(1) You open the meeting with a 2-3 minute statement about the importance of having a government-wide mechanism

to manage the continuing spot shortages of energy. You should stress your determination to personally see to it that the Federal government's responses to such shortages are well-managed.

You might commend the group for its well-coordinated and effective response to the independent truckers' strike last week and note that those efforts are paying off now in terms of the truckers' return to work.

(2) Following your opening statement, I will recognize each of the agency representatives to provide brief status reports on both trucker and gasoline shortage situations.

Please interrupt each report to get answers to any questions you have. Following these short briefings, you can leave the meeting. I will conclude the Task Force meeting in time to join you, Stu, Jim, et al. for the follow-up meeting in the Cabinet Room.

Up to mid 80's - 1st Team in 1990 Rev. 184 B97

3:15 PM

W'fall → Sec fund → Imp oil ↓ OPEC → most urgent Since '77 - realization slow Bold, forceful program

THE WHITE HOUSE

WASHINGTON

June 30, 1979

MEETING WITH ENERGY ADVISORS

Monday, July 2, 1979
(30 minutes)
The Cabinet Room 3:15 P.M.

From: Stu Eizenstat
Kitty Schirmer

I. PURPOSE

To meet briefly with your key energy advisors to review the status of various energy bills and administration initiatives on energy policy.

II. BACKGROUND, PARTICIPANTS, AND PRESS PLAN

A. Background: We are recommending that six topics be covered briefly to bring you up to date on actions which have taken place over the last week. A longer meeting is scheduled for Tuesday afternoon which will provide an opportunity to review the full scope of energy issues in greater detail. This overview is designed to highlight and set the stage for the longer discussion on Tuesday.

The six agenda items are:

- o House action on the windfall profits tax -- summary of major changes and outlook for Senate action. (Five minutes -- Treasury)
- o House action on the Moorehead synfuels bill -- major provisions and outlook. (Three minutes -- DoE)

H. Sen → Banking & Energy

- o The Jackson comprehensive energy bill -- summary and ~~schedule~~ for Senate action. (Three minutes -- DoE)

Bill has serious flaws

- o Task Force activities on synfuels/import reduction program -- major options, future schedule, and status of coal report. (Five minutes -- Stu)
- o ~~Legislative~~ and Administration actions on rationing -- status report and outlook. (Five ~~minutes~~ -- Stu)

Auth to develop - Subj cong disap at time by Cong

- o Gasoline price controls

No collusion or anti-trust proof

- o DoE/Justice Department investion of oil company activities -- status and preliminary findings. (Three minutes -- DoE, Justice)

We are recommeding that you give a very short opening statement, outlined below in the talking points. The press would be permitted a photo opportunity at the beginning of the meeting during your short statement.

B. Participants

Secretary Schlesinger
Al Alm (DoE)
Lynn Coleman (DoE)
Les Goldman (DoE)
Secretary Blumenthal
Don Lubick (Treasury)
Gene Godley (Treasury)
Ben Civiletti
Don Flexner (Justice)
Charlie Schultze
George Eads (CEA)
Jim McIntyre
Eliot Cutler
Henry Owen
Stu Eizenstat
Jack Watson
Frank Moore
Kitty Schirmer

C. Press Plan (subject as of this writing to Jody's approval) -- Press pool coverage with short opening statement.

III. TALKING POINTS

1. Before I left for the Tokyo Economic Summit, I asked you to undertake an intensive effort to determine how the funds in the Energy Security Trust Fund can best be invested to accelerate development of alternatives to imported oil which, coupled with strengthened conservation programs, will reduce our dependence on imported oil. In light of the massive price increases just announced by the OPEC cartel

that task has become all the more urgent. I am asking you to accelerate the development of a bold and forceful program to enhance domestic production and conservation. Our country simply cannot afford to and will not remain hostage to OPEC.

2. The U.S. public has been slow in recognizing and coming to grips with the serious and chronic nature of our energy problem. We have not moved as fast as I had urged, beginning with the National Energy Program of April 1977. I believe that Americans -- along with other peoples of the world -- are now ready to join us in a massive mobilization of our great national strength and resources to regain control over our energy future. While this cannot occur overnight, we will act now to begin to harness our vast coal and other natural resources for greater energy security. Although we may have been slow off the starting block -- as the U.S. has sometimes been in the past -- once we get going, nothing can stand in our way.

July 2, 1979

Synthetic Fuel Development Authority

I. Organizational Structure

A. Independent Federal Authority

The Authority would be chartered by Federal statute as an independent corporation, not located in any existing executive department, but responsible to the President. The responsibility and accountability for developing commercial scale sources of synthetic fuels would be centralized in the Authority which would be authorized to draw upon the expertise of the other Federal agencies. The Authority would have a main office in Washington, D. C. and field offices and agencies in the United States and abroad as necessary.

B. Duration

The statute chartering the Authority would require that it be liquidated and dissolved no later than June 30, 2000, subject to the right of the President to extend the deadline up to June 30, 2003. However, liquidation and dissolution would be required earlier if the national production goal of 2,000,000 barrels per day of oil substitutes were achieved sooner. If the goals were not achieved by those dates, Congress, of course, could always extend the Authority's duration.

Upon liquidation, the Authority's assets would be sold to the private sector and the proceeds distributed to the Treasury. Outstanding guarantee and contract liabilities would be assumed by the appropriate Federal agency.

C. Management

The Authority would be managed by a Board of seven directors which would be composed of the Secretaries of Defense, Energy and the Treasury, the Chairman of the Board, and three members appointed from the private sector. The Chairman of the Board and the directors chosen from the private sector would be appointed by the President with the advice and consent of the Senate and serve for terms of 5 years. The Chairman of the Board would be the chief executive officer of the Authority and would be a full time employee of the Authority. The compensation of the Chairman of the Board and the other Board members appointed by the President would be fixed by the President and would not be limited by the government pay scale. The Board of Directors would be authorized to appoint a limited number of officers and technical employees and to set their compensation without regard to the government pay scale. It would also be authorized to determine the level of the personnel requirements and the number of excepted appointments. All other employees would be covered by the civil service laws.

The Board of Directors, with the approval of the President, would be required to appoint a technical advisory committee of

at least five persons to advise it on technology and engineering matters relating to projects to be assisted by the Authority, and could appoint such other advisory committees as deemed appropriate. Advisory committees members may be chosen from among public officials and members of the private sector. In appropriate circumstances, the President would be authorized to exempt individual members of any advisory committee from the conflict of interest rules.

II. Purposes - The Development and Financing of Commercial Sources of Synthetic Fuels in Commercial Quantities.

The Authority seeks to facilitate the development of commercial scale production of synthetic fuels to reduce the United States reliance on foreign oil supplies. The production goals would be North American production (available to the U.S.) 1,000,000 barrels per day of oil substitutes by 1990 and 2,000,000 barrels per day by 1995. The sources of synthetic fuels would be defined broadly to include the production of fuel and chemical feedstocks from the liquifaction, gasification or other conversion of coal, shale, lignite, peat, solid wastes and other materials except crude oil. The Authority would ordinarily not assist the construction of transportation and distribution facilities except to the extent integral to the construction and operation of plants to produce synthetic fuel. The Authority would not be authorized to provide financial assistance to any project not located in North America. However, it would be authorized to consult with other

governments and to cooperate, where appropriate, in the attainment of its goals. The Authority would not be authorized to assist projects for the production of solar energy or for conservation except as incidental to the production of synthetic fuel.

III. Powers

The Authority would be given broad powers to construct, operate and dispose of plants and to provide financial assistance in the form of loans, guarantees, price guarantees, purchase contracts, equity interests and participations in joint ventures. The choice among the alternatives would be with the Board of Directors. One or more methods could be used in connection with any project.

A. Construction of Plants

The Authority would have the power to design, construct, manage and operate plants directly or under contracts with private parties. The Authority would be expected to divest itself of the plants as soon as commercially desirable even if not all of the Authority's costs associated with the plant's are recovered on disposition.

B. Loans

The Authority would have the power to make loans to entities constructing or operating facilities to produce synthetic fuel on such terms and conditions as the Authority deems appropriate. These loans would bear interest at a rate not less than 1/4% of one percent over the then current Treasury average yield on U.S.

Government securities of comparable maturities, as determined for the Authority by the Secretary of the Treasury. No loan could mature more than 25 years after the date of issuance. The Authority could waive any priority it might have under applicable law to make the loans on the same basis as the private market and could provide subordinated loans in appropriate circumstances. Security would be taken where appropriate. Loans could be provided only upon determinations that credit was not otherwise available to the private market on terms and conditions sufficient to provide for the construction and initial operation of the plant, and that, in light of the special risks which require the Authority's participation in the financing, there was a reasonable prospect of repayment.

C. Guarantees

The Authority would have the power to guarantee all or a portion of the principal and/or interest on the debt associated with the project on such terms and conditions as the Authority deems appropriate. The loans guaranteed by the Authority would bear interest at rates which were not considered excessive and could not mature more than 25 years after the date of issuance. The guarantees could be provided only upon determinations that credit was not otherwise available in the private market on terms and conditions sufficient to provide for the construction and initial operation of the plant, and that,

in light of the special risks which require the Authority's participation in the financing, there was a reasonable prospect of repayment of the guaranteed debt. The timing of the issuances of any guaranteed debt would be reviewed by the Secretary of the Treasury. A guarantee fee of at least 1/4 of 1% per annum would be charged. The Authority could waive any priority it might have under applicable law so that its guarantee would be made on the same basis as loans made by the private market. Security would be taken when appropriate.

D. Contracts

The Authority would be given broad contractual authority to acquire synthetic fuels, including the power to enter into purchase contracts for specific quantities at specific prices, guaranteed price contracts where the Authority would have to option of refusing delivery and paying the differential between the guaranteed price and the market price and other types of contracts which may be used in lieu of guarantees to obtain financing in the private market. Contracts which serve the function of guarantees could be provided only upon a determination that financing was not otherwise available in the private market on terms and conditions sufficient to provide for the construction and initial operation of the plant and that, in light of the overall financing arrangements for the project, such contract provides the Authority the best available terms for its participa-

tion. Such contract's could not extend beyond 25 years from the date entered into.

E. Participation in Joint Ventures and Other Equity Investments

The Authority would have the power to acquire equity interests and to participate in joint ventures. These could be provided only (i) in connection with the provision of other forms of financial assistance or (ii) on a determination that financing was not otherwise available in the private market on terms and conditions sufficient to provide for the construction and initial operation of the plant.

F. Patents

The Authority would have free use of any patents held by the United States or any department or agency thereof. The Authority could grant non-exclusive licenses in any such patents for use in connection with projects for which it is authorized to provide financial assistance.

Title to patents and inventions developed by the Authority would vest in the United States. Title to any patents and inventions developed by any participant in a project assisted by the Authority would vest in the United States if directly related to the work performed on the project. This requirement could be waived if the Authority determined it to be in the best interests of the United States and retained a non-exclusive royalty free license and the right to require the owner to issue non-exclusive licenses to third parties on payment of reasonable royalties.

The Authority would have use of all patents registered in the United States for purposes of constructing and operating its own plants and providing technology for those projects for which it could provide financial assistance. The owner of any such patents would be entitled to the payment of reasonable royalties.

G. Disposition of Plants and Synthetic Fuel.

The Authority could dispose of any plants on such terms and conditions as it shall deem appropriate. Dispositions could be made by competitive bid or negotiated sale after bids have been requested. Plants would be sold as soon as commercially desirable, subject to appropriate safeguards to assure the United States access to the plants and their output for national defense needs. Synthetic fuel and other by-products not required by the United States for national defense purposes would be sold by competitive bid.

H. General

The Authority would have full general corporate powers, including the power to incorporate subsidiaries with similar privileges and immunities, to acquire, dispose of and pledge assets needed in the conduct of its affairs, to exercise the power of eminent domain and to authorize third parties to exercise such power, and to borrow money and issue guarantees with the pledge of the faith and credit of the United States. The property and operations of the Authority would be exempt from all taxation except for State and local real property

taxes imposed on the same basis as on other property similarly situated.

IV. Regulatory Procedures

The Authority would coordinate the regulatory approval process on the Federal, State and local level. It could designate projects to produce synthetic fuel as priority projects whether or not the Authority provides financial assistance and would be the only agency required to file an environmental impact statement. The designation would be published in the Federal Register together with a tentative Project Decision Schedule of regulatory actions required to be taken and notice that an environmental impact statement was available. Comments would be required from all Federal, State and local agencies which have regulatory authority over the construction and initial operation of the project and from the general public within 30 days of the date of publication of the tentative schedule in the Federal Register. Not less than 60 days after the designation, the Authority would publish a Final Project Decision Schedule. The deadlines set in the Final Project Decision Schedule would be consistent with those set by applicable law but in any event would require action within 12 months of the date of application to an agency unless the Authority determined that shorter periods were required in the national interest. If a deadline is not met, the Authority, with the concurrence of the President,

could make the decision in the case of Federal agencies or provide an exemption in the case of State or local agencies. If any decision is in the negative, the Authority, with the concurrence of the President, could issue an exemption or variance upon a finding that, having due regard for the policies expressed in the law involved and the goals of the Authority, such exemption or variance is in the best interests of the United States. The Authority would certify that decisions had been made and public notice thereof in the Federal Register.

The Authority would also be authorized, with the concurrence of the President, to provide exemptions from antitrust, environmental, safety and other laws upon a determination that, having due regard for the policies expressed in such laws and the goals of the Authority, such exemption is in the best interests of the United States. Any exemptions could be conditioned on terms and conditions set by the Authority. These exemptions could be provided in connection with the setting of the Project Decision Schedule. Notice of all exemptions would be published in the Federal Register.

V. Judicial Review

Any decisions by the Authority in issuing an environmental impact statement, designating a priority project, setting a Final Project Decision Schedule, making a decision or creating an exemption and any decision by a regulatory agency would not be subject to judicial review except to determine whether such decision was arbitrary or capricious. Decisions by such regulatory agencies

would not be subject to judicial review until certified by the Authority as being in accordance with the Final Project Decision Schedule.

Any proceeding attacking any action by the Authority would be barred unless instituted within 60 days of the date notice thereof was published in the Federal Register. Any proceeding attacking any action taken by a regulatory agency would be barred unless instituted within 60 days of the date such action was certified by the Authority. All proceedings would be instituted only in the United States Court of Appeals in the District of Columbia. All decisions would be rendered on an expedited basis within 90 days from the date such a proceeding was instituted, unless otherwise required by the Constitution. The Supreme Court would have exclusive jurisdiction to hear any appeals from any order by such Court of Appeals. Petitions for review would be required within 15 days of any order and would be decided by the Supreme Court within 45 days of the petition unless the Supreme Court determines that a longer period of time is required under the Constitution. Injunctions could be issued only in connection with final court orders.

VI. Capitalization and Budget Treatment

The Authority would be capitalized as follows: up to $6 billion in equity would be funded out of the Energy Security Fund and up to $40 billion in debt and principal amount of guarantees could be outstanding at any one time. The equity would be funded

as required by the Authority over a four year period subject to the following commulative limits:

1980	$250 million
1981	$2.25 billion
1982	$5.25 billion
1983	$6.00 billion

The equity funds would be shown in the budget of the United States and subject to the appropriation process. However, under the authorizing legislation, the Authority's activities would not otherwise be included in the budget or be subject to the appropriation process. Dividends would be paid on the capital stock held by the Treasury to the extent the Authority realized any net income after creation of such contingency reserves as the Authority deems appropriate.

The Authority would be required to prepare an annual budget which would be subject to OMB review. Annual audits by the GAO and quarterly reports to Congress would also be required.

July 2, 1979

Summary of Major Policy Decisions

The focus of this proposal is to create an entity with sufficient authority and resources to achieve significant and achievable levels of North American production of synthetic fuels available in the United States in the shortest practical time. This necessarily means giving it the power to override restrictions presently applicable in this area--but with acceptable safeguards still provided.

I. Organization

(a) The Authority would be an independent Federal agency responsible to the President. This option was chosen to centralize the decision making responsibility and accountability and to enable the Authority to attract the best specialized production personnel available. The creation of the independent Authority also maximizes the political visibility of taking action to deal with the synthetic fuel problem. However, in concept it runs contrary to many of the Administration's previous views on reorganization and departmental responsibility.

(b) The Authority will have a 20 year duration to minimize the incursion into the private sector and to support its status as a self-liquidating off budget agency designed to meet a specific problem and to disappear in an appropriate time period. Earlier termination is required in the event the

Authority reaches its ultimate goal of 2,000,000 barrels per day before 2000. Other versions of this proposal have suggested 10 and 15 year durations. However, estimates indicate that the construction cycle may be at least 10 years and the 1,000,000 barrels per day by 1990 and 2,000,000 barrels per day by 1995 is achievable.

(c) The size of the Board of Directors would be limited to seven persons with only the Secretaries of Defense, Energy and the Treasury on the Board. Other Departments such as Interior, Commerce and Transportation would not have representation. The Chairman of the Board would be a full time employee of the Authority with the requisite skills in production project organization and financing. Provision has been made for payment of salaries to officers and technical employees at rates higher than the government pay scale since oil industry pay scales for technically qualified personnel vastly exceed SES levels and it is anticipated that initial personnel would not stay for the life of the Authority. Wide discretion has been left in the Board of Directors to set salary and personnel levels and provide excepted appointments as opposed to setting specific limits in the enabling legislation.

II. Purposes

The Authority's purposes have been limited to the development of synthetic fuel sources on a commercial scale. North American production goals have been set at 1,000,000 barrels

per day in 1990 and 2,000,000 barrels per day by 1995 available in the United States. As in the Moorhead proposal, the emphasis is on commercial scale production; the Jackson proposal emphasizes the construction of demonstration plants. Transportation and distribution facilities incidental to the construction of synthetic fuel plant may be assisted. Plants may be located anywhere in North America to permit participation in shale or tar sand projects in located in Western Canada. Conservation, solar energy, leasing of federal lands, development of other energy sources and other proposals have not been considered within the scope of the Authority.

III. Powers

The basic theory of the proposal is to give the Authority the widest range of techniques: construction and operation of plants, loan and guarantee authority, authority to enter into take or pay or requirement contracts or guaranteed price arrangements and authority to make equity investments including participation in joint ventures. The Authority would decide on the appropriate technique or techniques, depending on the situation of each project and its conclusions as to which would provide the fairest terms for the U.S. It is believed inappropriate to decide in advance (as the Moorhead bill does) which techniques will be used for all projects. No grant authority has been provided, nor has the Authority been given any responsibility with respect to any tax incentives

which may be proposed.

The Authority is also given broad authority to dispose of facilities and fuel on the best terms commercially available, even if at a loss. No specific time limit is set on the disposition of plants. The patent authority parallels that provided for NASA except that third parties could be authorized to use patents. The Authority has been given condemnation power.

IV. Regulatory Procedures

Procedures have been established for speeding the Federal, state and local regulatory process by creating a Project Decision Schedule. Furthermore, the Authority, with the concurrence of the President, may grant exemptions from laws such as the antitrust and environmental laws, where appropriate, and may act where deadlines are missed. These powers go beyond the other proposals currently introduced on the Hill and would be politically difficult to obtain.

In contrast, the Moorhead bill sets strict time deadlines on the Federal level without taking into account State and local actions and leaves the decision making power in the regulatory agencies. No exemptive powers are provided. The Jackson proposal provides for an overall decision schedule which would be mandatory on the Federal level but would serve only to set as milestones on the State and local level.

It does provide for Presidential decisions when Federal agencies have missed their deadline but does not provide exemptive powers.

V. Judicial Review

Decisions made by the Authority would be subject to judicial review only during limited time periods which would normally end seven months from the date the decision was made. The scope of the review would be limited to determining whether the action was arbitrary. Review of decisions by regulatory agencies would be subject to similar restrictions after certification with the Authority. Review would be limited to final orders and injunctions could be issued only in connection with final orders. These provisions are similar to the Jackson proposal and the legislation adopted for the Alaska Pipeline. The Moorhead bill contains no such provisions.

VI. Capitalization and Budget Treatment

In theory, the Authority could be self-sustaining. Therefore, it is proposed that only investments in the equity of the Authority be included in the U.S. budget and subject to the appropriation process. Otherwise, the budgetary impact would be substantial since all loans, equity investments, and long-term purchase contracts would require appropriations in advance, and guaranteed price contracts would require annual appropriations based upon CBO estimates of payments to be made during the year. The amounts could approach $40 million in the first few years.

The actual operations of the Authority would be determined by the Board of Directors subject to OMB review. Amounts payable for the equity would be drawn from the Energy Security Fund as opposed to the General Fund of the Treasury.

The Authority would be authorized to issue a combined amount of $40 million in guarantees and debt on a revolving basis. These amounts assume that 20 operating plants will be required to meet the production goals of 1,000,000 barrels per day and greater numbers for 2,000,000 barrels per day. Each plant is estimated to cost between 1-1/2 and 3 billion dollars. Additional capacity is left for cost increases and other contingencies.

TRANSFER SHEET

Jimmy Carter Library

COLLECTION: Presidential Handwriting File

Acc. No.: 80-1

The following material was withdrawn from this segment of the collection and transferred to the X Audiovisual Collection ___Museum Collection ___Book Collection ___Other (Specify:)

DESCRIPTION:

8x10 color photos of the following:

1. Rock Island District Headquarters
2. Rock Island Arsenal
3. Sailing off Arsenal Island
4. LeClaire, Iowa
5. Power Station
6. Flood Protection Project, Fulton, Illinois
7. Flood Protection Project, Clinton, Illinois
8. Lock and Dam Number 13
9. Mississippi River
10. Mississippi River near Savanna, Illinois
11. Dubuque, Iowa

Series: Chron File

Box No.: 137

File Folder Title: 7/2/79 [1]

Transferred by: Foulk

Date of Transfer: 7/18/90

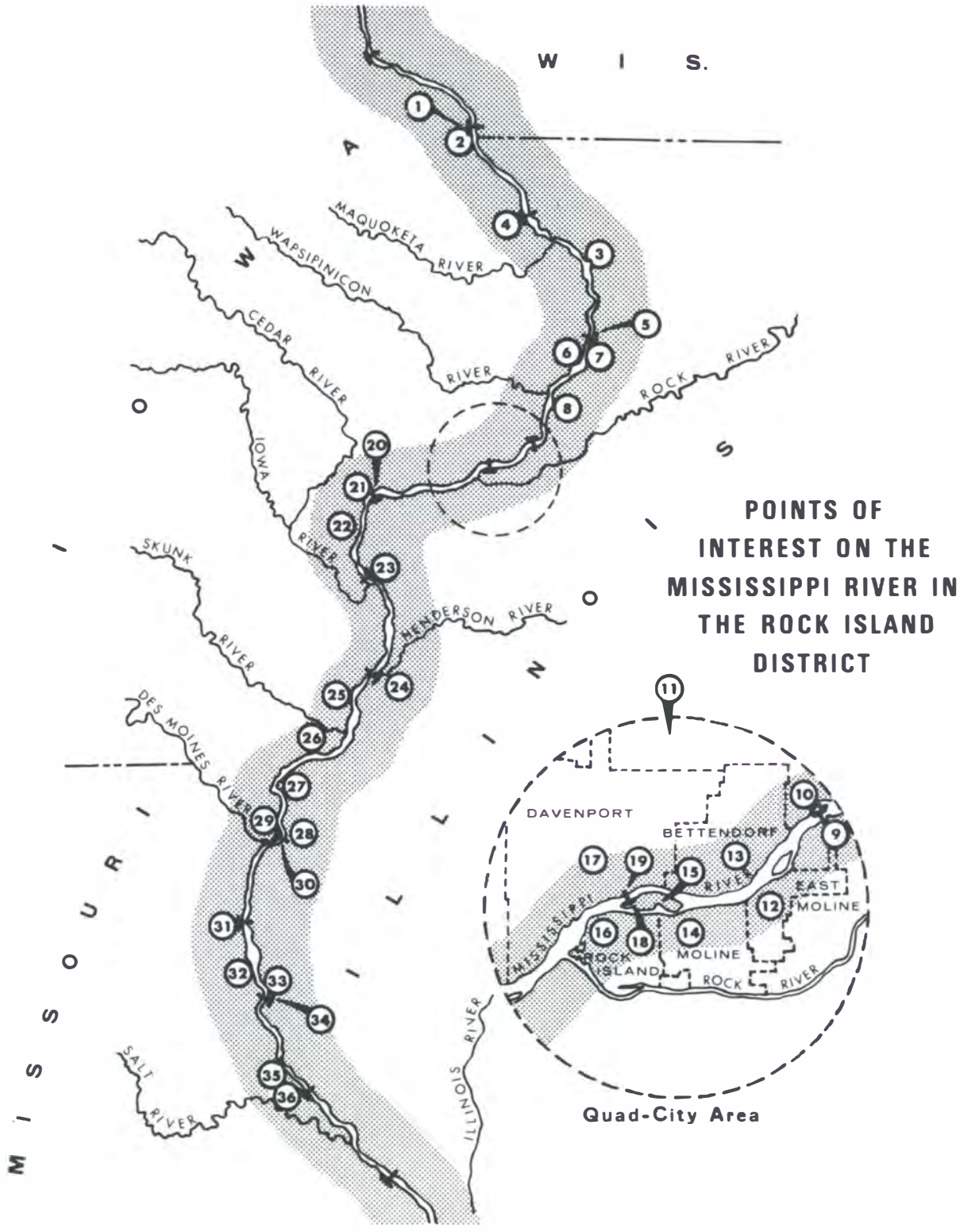
DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

REPLY TO
ATTENTION OF:

The purpose of this book is to highlight points of interest on the Mississippi River that are located in the Rock Island District of the US Army Corps of Engineers. The Rock Island District extends from north of Dubuque, Iowa, to south of Hannibal, Missouri. Twelve of the 29 locks and dams on the Mississippi River are located in this reach.

The points of interest are numbered on a map with corresponding numbers shown on the index. Separate pages provide information on each subject.

F. W. MUELLER, Jr.
Colonel, Corps of Engineers
District Engineer



POINTS OF INTEREST ON THE MISSISSIPPI RIVER IN THE ROCK ISLAND DISTRICT

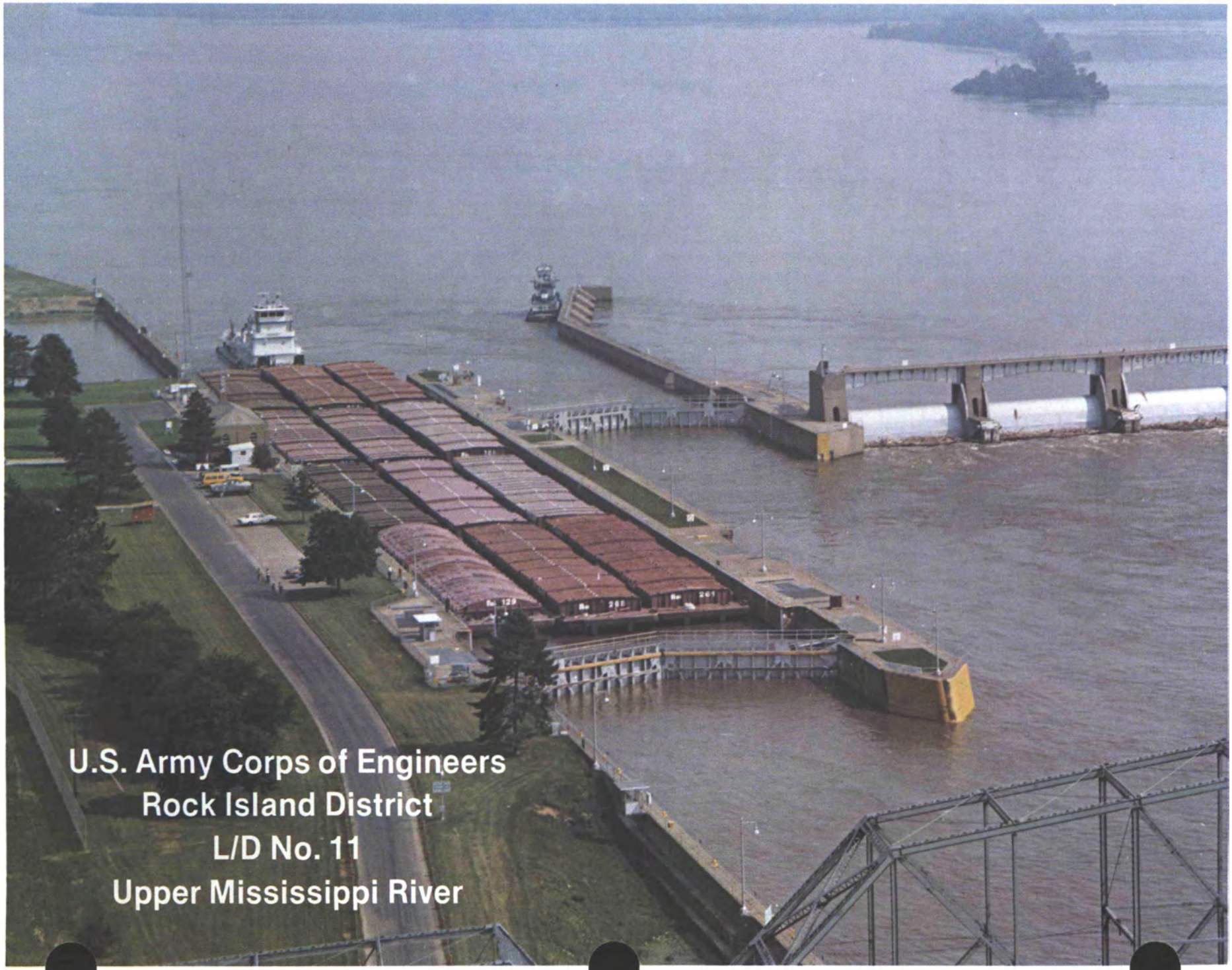
Quad-City Area

POINTS OF INTEREST ON
MISSISSIPPI RIVER IN
ROCK ISLAND DISTRICT

River Mile	No. Key	
583	1	Lock and Dam No. 11, Dubuque, Iowa
583-578	2	Dubuque, Iowa
558-545	3	Savanna Army Depot Activity
557	4	Lock and Dam No. 12, Bellevue, Iowa
523	5	Lock and Dam No. 13, Fulton, Illinois
522-517	6	Clinton, Iowa - Corps of Engineers' levee project and small boat harbor under construction
521-519	7	Fulton, Illinois - Corps of Engineers' levee project under construction
507	8	Quad-City Nuclear Generating Station
493	9	Lock and Dam No. 14, LeClaire, Iowa
493	10	LeClaire Lock - Original navigation lock built in 1922 to get boat traffic around Rock Island Rapids. Lock is being rehabilitated for recreational boat traffic.
491	11	Quad-City area - Made up of nine cities and towns. Largest population area on the Mississippi River between St. Paul, Minnesota, and St. Louis, Missouri. Farm Implement center of United States.
491-488	12	East Moline, Illinois - International Harvester Co. and John Deere plants located along river. Construction of Corps of Engineers' local flood protection project began in 1979.
491-485	13	Bettendorf, Iowa - J. I. Case Co. plant. Corps of Engineers' levee project in design stage.
488-485	14	Moline, Illinois - World headquarters of John Deere and Co. Number of John Deere plants. Corps of Engineers' levee project in design stage.
486-483	15	Arsenal Island - Headquarters of US Army Armament Materiel Readiness Command and Rock Island Arsenal.

River Mile	No. Key	
485-479	16	Rock Island, Illinois - International Harvester Co. and J. I. Case Company plants near river. Corps of Engineers' local flood protection project scheduled for completion in 1980.
485-476	17	Davenport, Iowa Largest city of Quad-City area. Corps of Engineers' local flood protection project in design stage.
483	18	Headquarters of Rock Island District, US Army Corps of Engineers
483	19	Locks and Dam No. 15, Rock Island, Illinois
457	20	Lock and Dam No. 16, Muscatine, Iowa
456	21	Mad Creek flood protection project built by Corps of Engineers, under construction.
455-442	22	Muscatine Island Levee District, Iowa - Corps of Engineers' project to raise existing levees in planning stage.
437	23	Lock and Dam No. 17, New Boston, Illinois
411	24	Lock and Dam No. 18, Burlington, Iowa
405-401	25	Burlington, Iowa - Corps of Engineers' local flood protection project in design stage.
396-387	26	Green Bay Levee and Drainage District No. 2 - Corps of Engineers' project to raise existing levees in planning stage.
377-375	27	Nauvoo, Illinois - Home of the Mormans from 1839-1846, when they migrated to Utah.
364	28	Site of only privately owned hydroelectric power dam on the Mississippi River. Completed in 1913 and in operation since then. Owned and operated by Union Electric Co. of St. Louis, Missouri.
364	29	Lock No. 19 - One of two 1,200-foot-long navigation locks on the Upper Mississippi River.
364	30	Old lock and dry dock being closed off by Corps of Engineers, because of deteriorating condition of the structures. Work is underway.
343	31	Lock and Dam No. 20, Canton, Missouri
335-332	32	Union Township Drainage District, Missouri - Levee improvements by Corps of Engineers is in design stage.

River Mile	No. Key	
328	33	Quinsippi Island Recreational Development - Aerial skyway from city to island, developed by Quincy Park Board.
325	34	Lock and Dam No. 21, Quincy, Illinois
311-307	35	Hannibal, Missouri - Boyhood home of Samuel Clemens (Mark Twain)
301	36	Lock and Dam No. 22, Saverton, Missouri


U.S. Army Corps of Engineers
Rock Island District
L/D No. 11
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 11 (UMR MILE NO. 583.0)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

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Lock & Dam 11 is one of the 12 navigation structures operated by the Rock Island District. It is located at Dubuque, Iowa. Construction began in December 1933 and was completed in September 1937, at a cost of $7,443,000.

The dam has a total length of 4818 feet. The movable gate section is 1278 feet long and consists of 16 gates; 3 roller gates and 13 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, one housing operating machinery for each of the 3 gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 3540-foot dike of earth and sand fill.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 11.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

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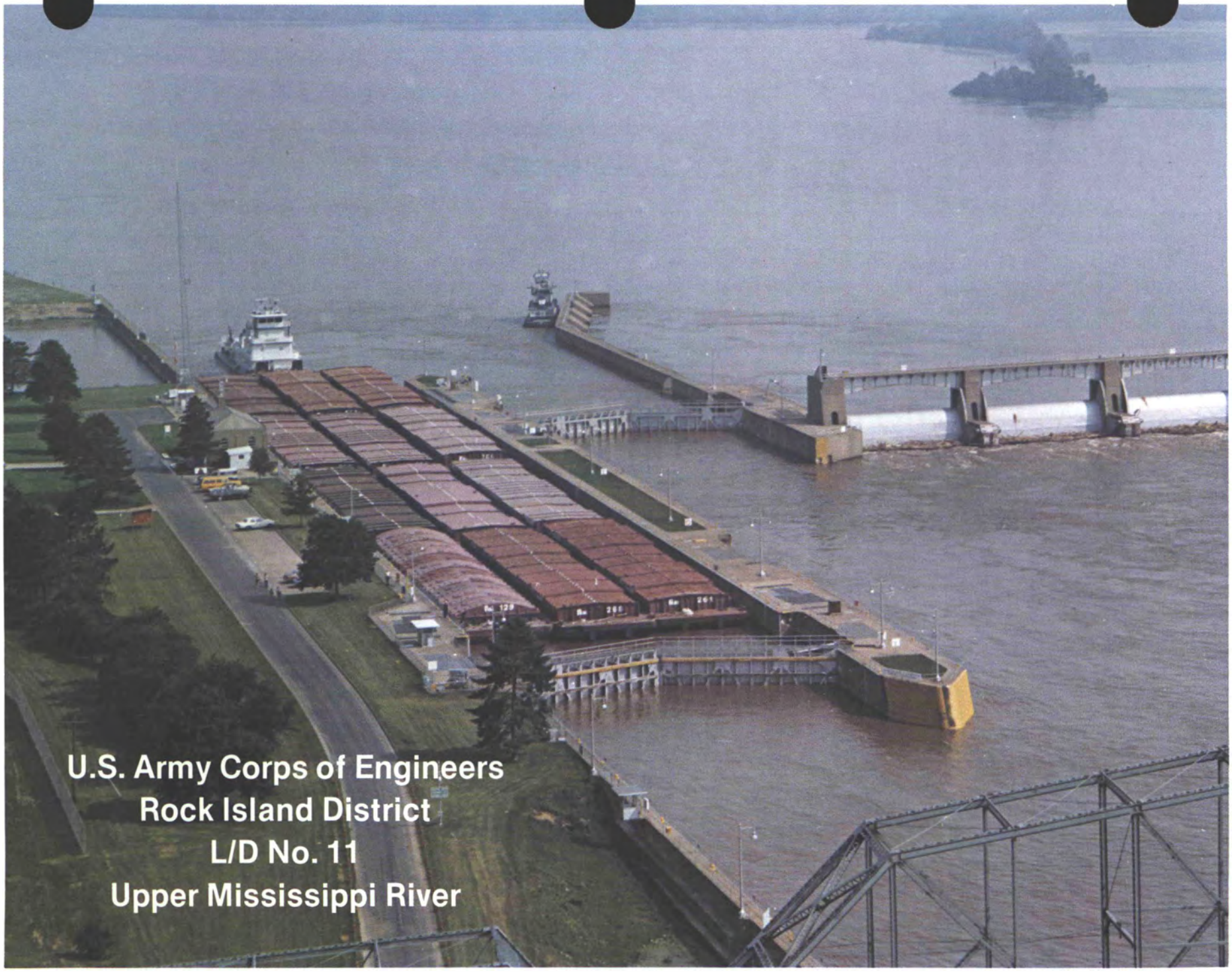
U.S. Army Corps of Engineers
Rock Island District
L/D No. 11
Upper Mississippi River

BUILDING TOMORROW TODAY

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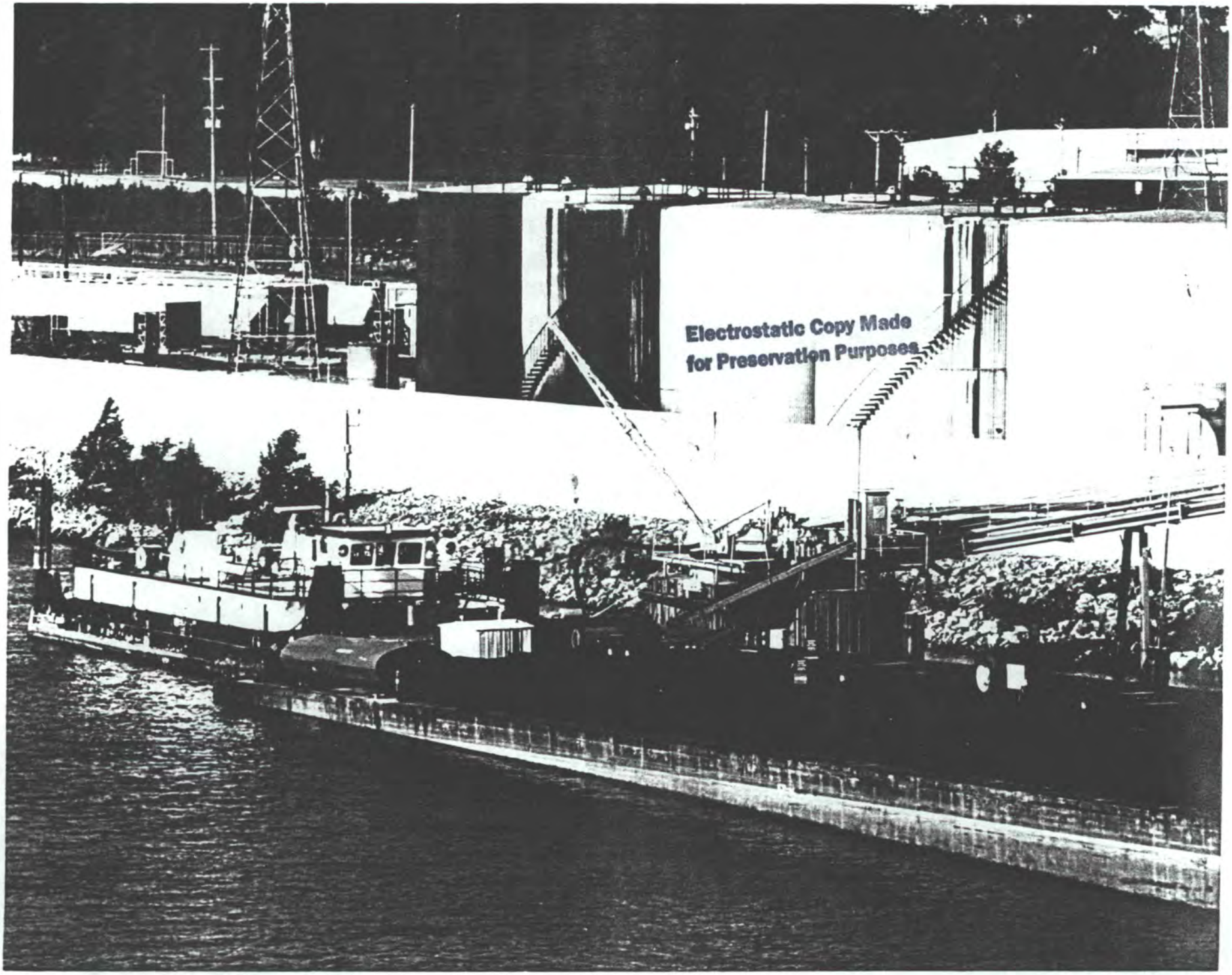


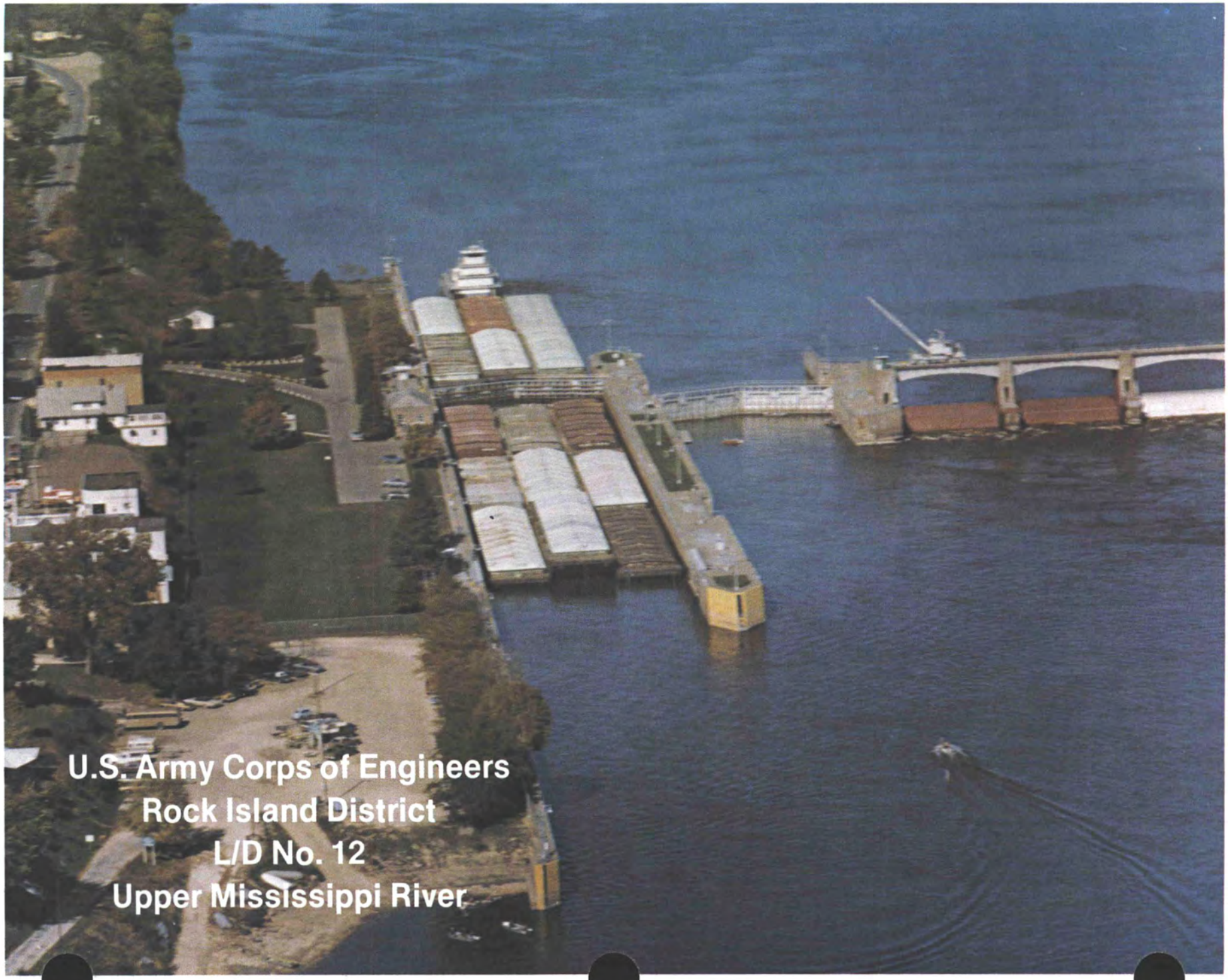
Dubuque, Iowa

One of the oldest cities in Iowa. Named for Julien Dubuque, a French-Canadian fur trader who received permission from the Fox Indians in 1788 to work lead mines in the area. A huge limestone monument on a bluff overlooking the river just below the city marks his grave. Dubuque is a major commercial and religious center. Catholic, Lutheran and Presbyterian seminaries are all located in the city. Dubuque suffered from periodic floods and the city is now protected by a Corps of Engineers flood protection project completed in 1973. The photo shows an oil barge being unloaded over the Dubuque floodwall.

2

The Mississippi River
near Savanna, Illinois

One of the most beautiful sections of the Mississippi River in the Rock Island District is the area near Savanna, Illinois. High forested bluffs overlook the river and many heavily wooded islands dot the river. The Mississippi Palisades State Park is located along the Illinois side of the river and the Savanna Army Depot Activity is located just north of this area. The bridge between Savanna, Illinois and Sabula, Iowa, the Island City, is in the background of this picture.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 12
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 12 (UMR Mile No. 556.7)

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Lock & Dam 12 is one of the 12 navigation structures operated by the Rock Island District. It is located at Bellevue, Iowa. Construction began in December 1933 and was completed in October 1938, at a cost of $5,574,000.

The dam has a total length of 8369 feet. The movable gate section is 849 feet long and consists of 10 gates; 3 roller gates and 7 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, one housing operating machinery for each of the 3 gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 7520-foot dike of earth and sand fill.

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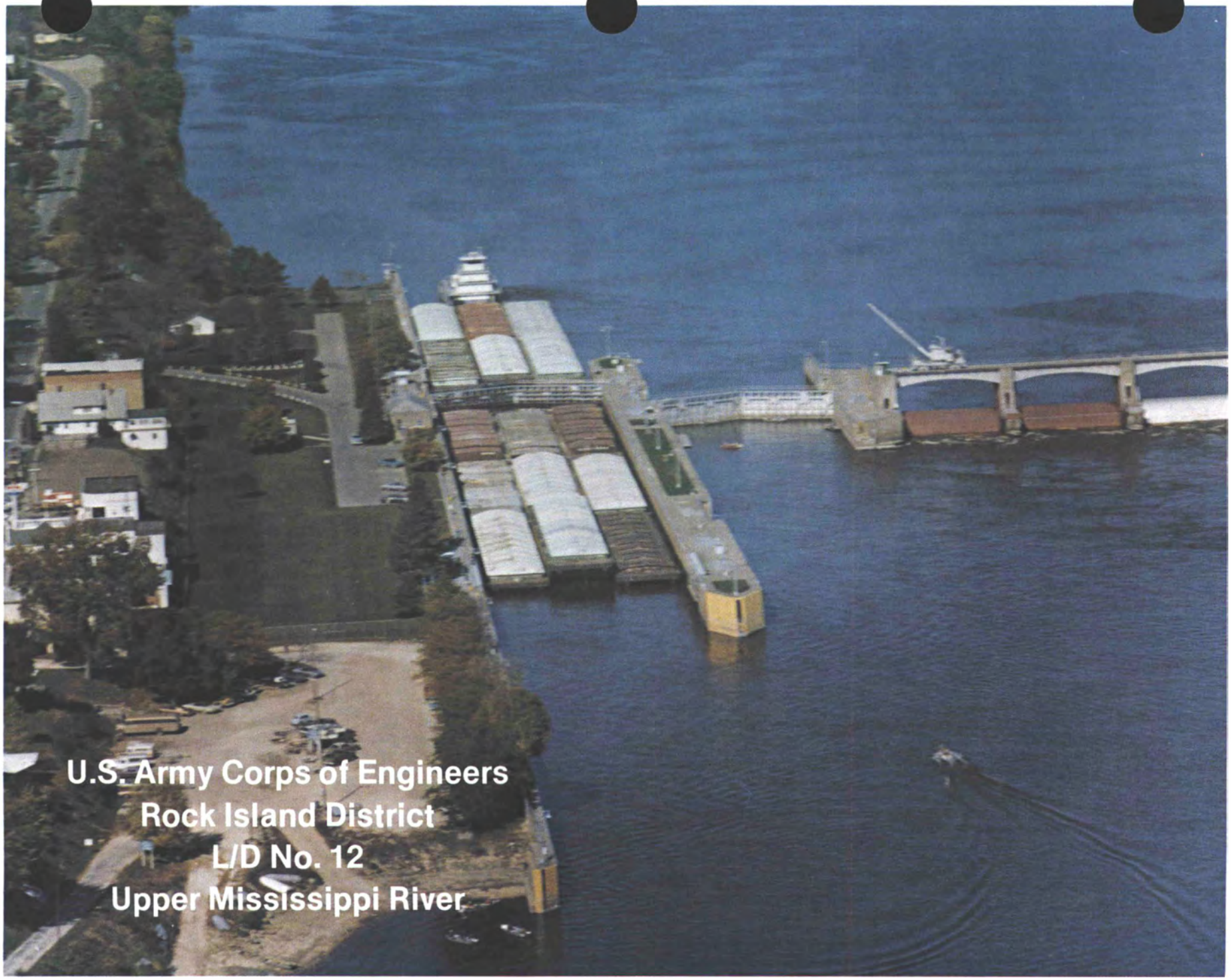
U.S. Army Corps of Engineers
Rock Island District
L/D No. 12
Upper Mississippi River

BUILDING TOMORROW TODAY

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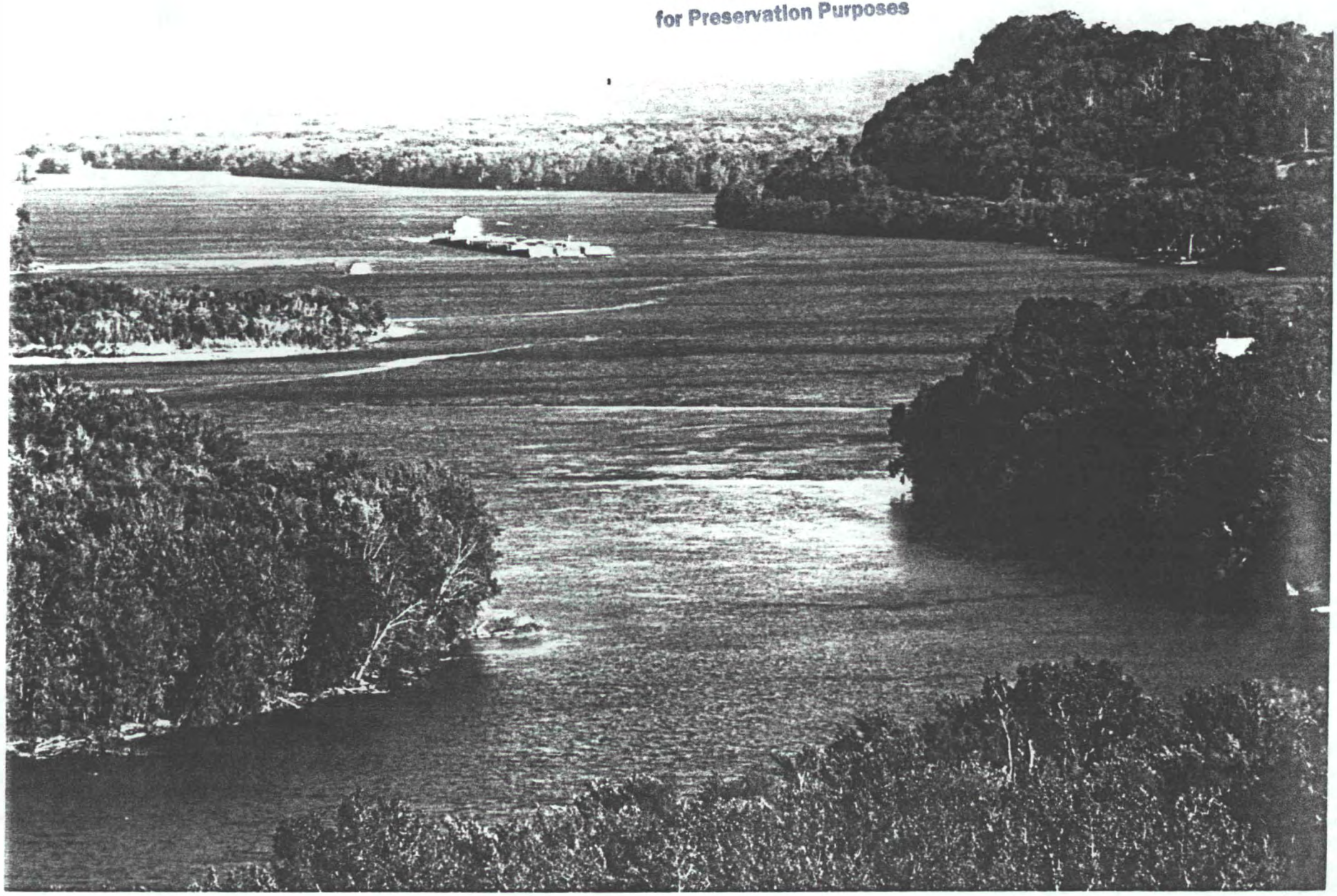


COMPARE

River Transportation
Iowa Department of Transportation
5268 N.W. 2nd Avenue
Des Moines, Iowa 50313
515/281-4292

CARGO CAPACITY

BARGE
1500 TON
52,500 BUSHELS
453,600 GALLONS

15 BARGE TOW
22,500 TON
787,500 BUSHELS
6,804,000 GALLONS

JUMBO HOPPER CAR
100 TON
3,500 BUSHELS
30,240 GALLONS

100 CAR UNIT TRAIN (GRAIN)
10,000 TON
350,000 BUSHELS
3,024,000 GALLONS

LARGE SEMI
25 TON
875 BUSHELS
7,560 GALLONS

EQUIVALENT UNITS

1 BARGE

=

15 JUMBO HOPPERS

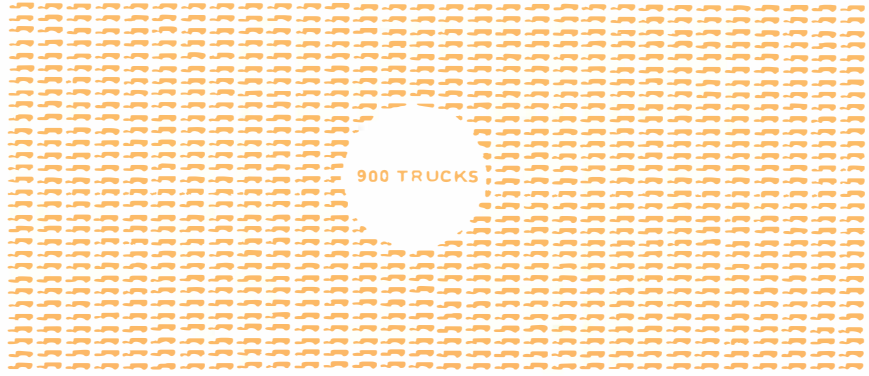
=

1 TOW

=

2¼ UNIT TRAINS

=



EQUIVALENT LENGTHS

¼ MILE

15 BARGE TOW

2¾ MILES

2¼ UNIT TRAINS

36 MILES
ASSUMING 150 FT.
BETWEEN TRUCKS

Prepared by:
Planning and Research Division
Iowa Department of Transportation


U.S. Army Corps of Engineers
Rock Island District
L/D No. 13
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 13 (UMR Mile No. 522.5)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

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Lock & Dam 13 is one of the 12 navigation structures operated by the Rock Island District. It is located 2.2 miles upstream from the town of Fulton, Illinois. Construction began in July 1935 and was completed in April 1939, at a cost of $7,643,000.

The dam has a total length of 14,078 feet. The movable gate section is 1,066 feet long and consists of 13 gates, 3 roller gates and 10 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each housing operating machinery for one of the 3 gates. The machinery in the control houses raise and lower the gates, as necessary, (by means of a huge chain). The tainter gates of the dam differ in shape and method of operation from the larger roller gates. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of two dikes totaling 13,012 feet.

The upper pool formed by Lock & Dam 13 is the widest in the Rock Island District, spanning approximately 4.0 miles at a point 2.5 miles above the dam. This feature has made it one of the most popular recreational areas in the District. Also interesting is a pristine sand prairie extending along the Illinois shore northwest from the lock and dam to the southern limits of Thomson, Illinois.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 11.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

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U.S. Army Corps of Engineers
Rock Island District
L/D No. 13
Upper Mississippi River

BUILDING TOMORROW TODAY

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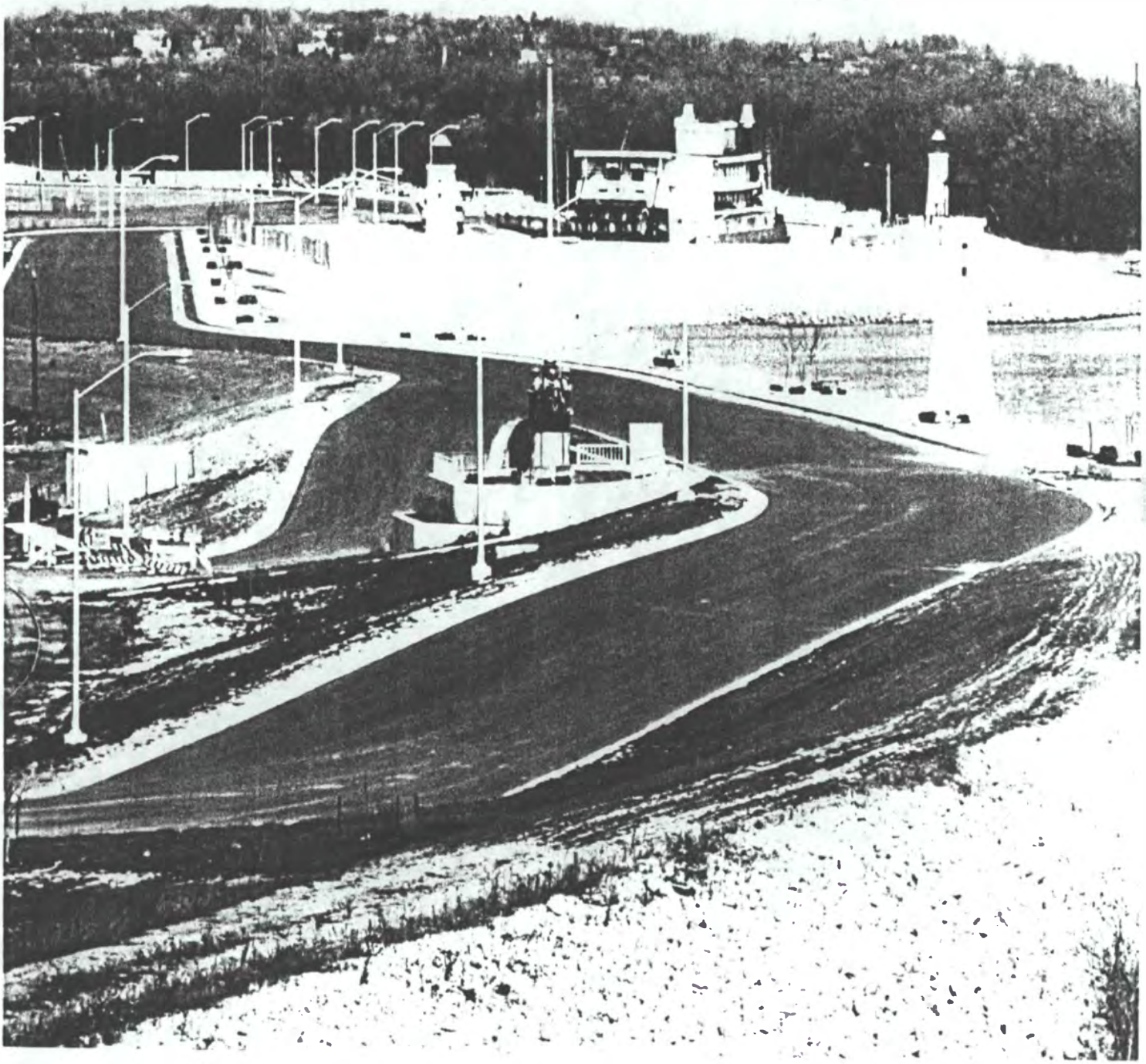
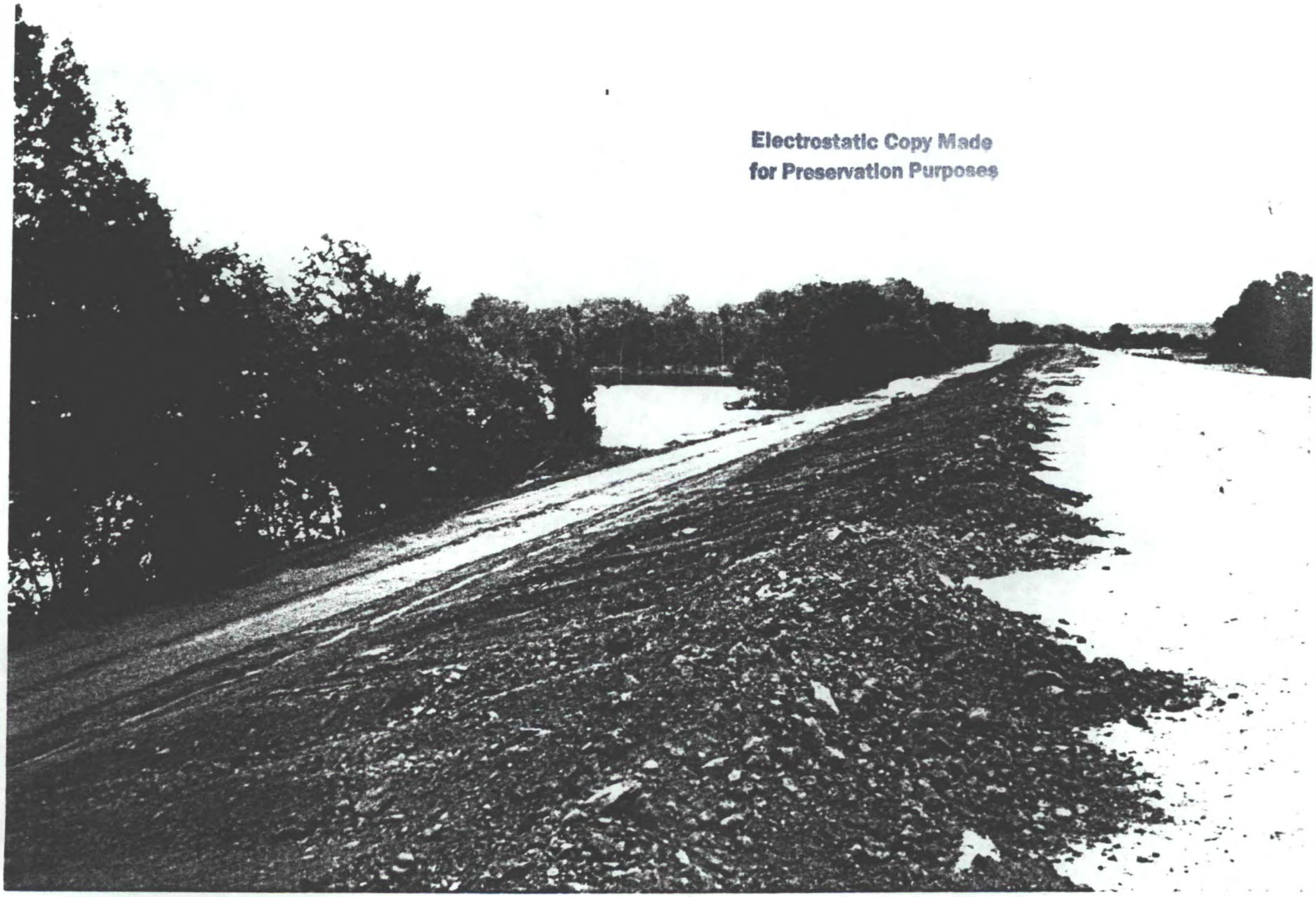
Observation Platform at
Lock and Dam No. 13

Outdoor Observation platforms are located at many of the Corps of Engineers locks and dams to allow the public to watch Mississippi River traffic. These areas are very popular during the summer months, especially when the "Delta Queen" and the "Mississippi Queen" are locking through. Public recreational areas, including camping and picnic areas, are also located at some of the locks and dams.



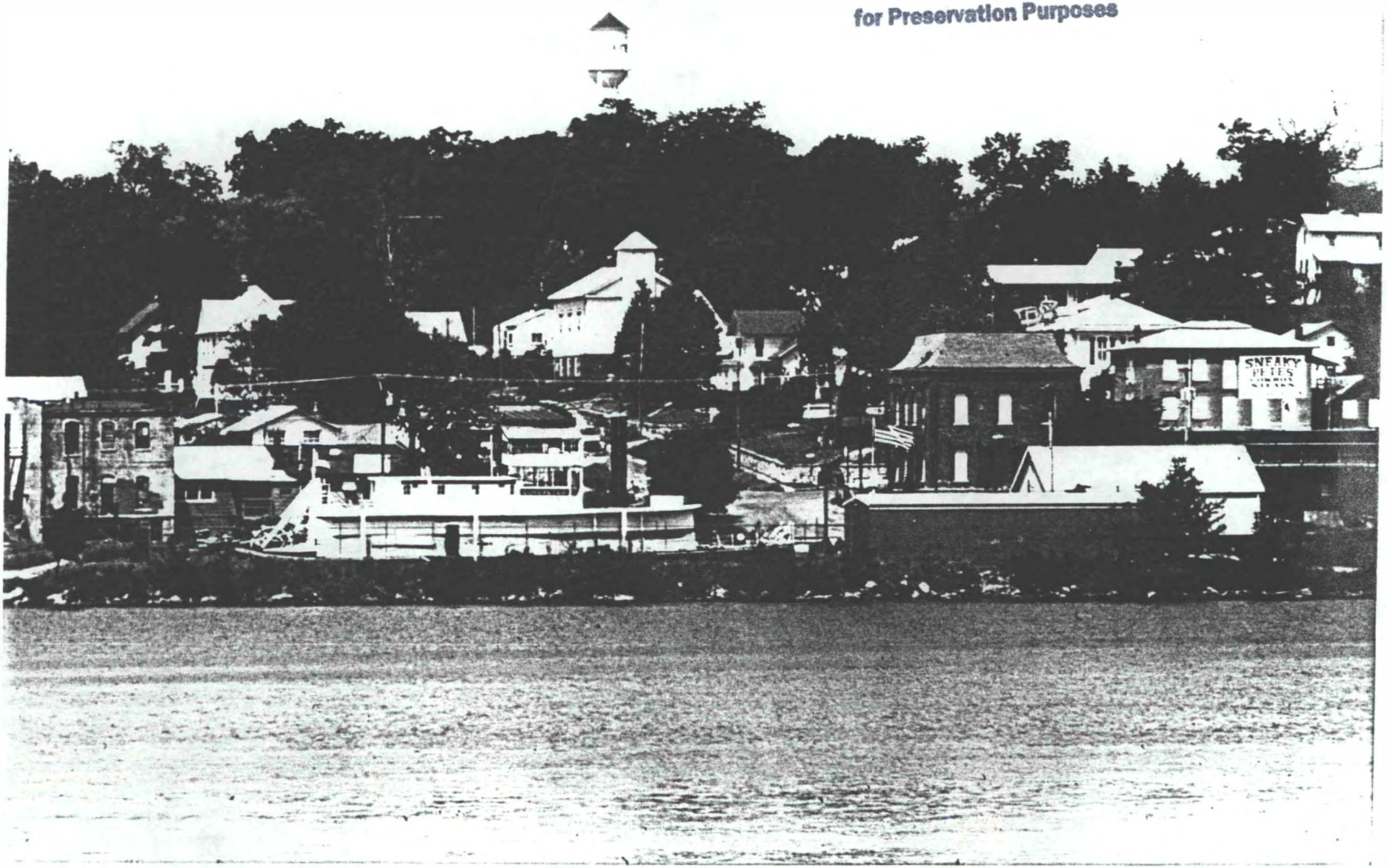
Clinton, Iowa - Mississippi River
Local Flood Protection Project

A flood protection project is currently under construction along the riverfront in Clinton, Iowa. In the record flood of 1965, flood damage at Clinton amounted to over 5½ million dollars. Over 50 business and industrial firms were temporarily out of operation, and about 50 square blocks of residential area in the northern and southwestern portions of the city were flooded. Extensive emergency protection works spared the city from even heavier damage. The Clinton project consists of two segments; one along the Mississippi River and Mill Creek, and the other along Beaver Slough. The project provides for construction of about 8.1 miles of earth levee and about 3/4 mile of concrete floodwall along most of the city's waterfront. Railroad raises, street ramps, closure structures, pumping plants, and gravity drainage outlets also form a part of the plan. The project is currently 80 percent complete. Construction of the first part of the project was completed with beneficial use in September 1978. This unit provides independent protection for the entire downtown residential and commercial area of Clinton. Project completion is scheduled for FY 1981.



Fulton, Illinois - Mississippi River
Local Flood Protection Project

A flood protection project is currently under construction along the riverfront in Fulton, Illinois. Fulton is located on the Mississippi River across from Clinton, Iowa. This project will protect both Fulton, Illinois, and the Cattail Drainage District. The Fulton Flood Control District, the local sponsor, has approved a local cooperation agreement and the State of Illinois has agreed to pay part of the local cost of this project. This project consists of two sections of levees beginning at Lock and Dam No. 13 and extending along the riverfront to the south edge of Fulton. Other features include the replacement of two railroad bridges and other structures. The entire project was 20 percent complete as of 31 July 1979 and is scheduled for completion in June 1982.



LeClaire, Iowa

Boyhood home of William F. Cody, better known as "Buffalo Bill". LeClaire is located at the upper end of the former Rock Island Rapids, which was a major hinderance to river navigation until the lock and dam system was built during the 1930's. At one time this was the home of more steamboat captains than any other town on the Mississippi River. The Green Tree, a huge elm tree, once stood on the LeClaire riverbank and provided shelter for the rapids pilots, who guided the wooden-hulled steamboat through the treacherous rapids. An old steamboat, the "Lone Star" is dry-docked on the LeClaire riverfront along with a museum building which contains many relics from the steamboat era.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 14
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 14 (UMR Mile No. 493.3)

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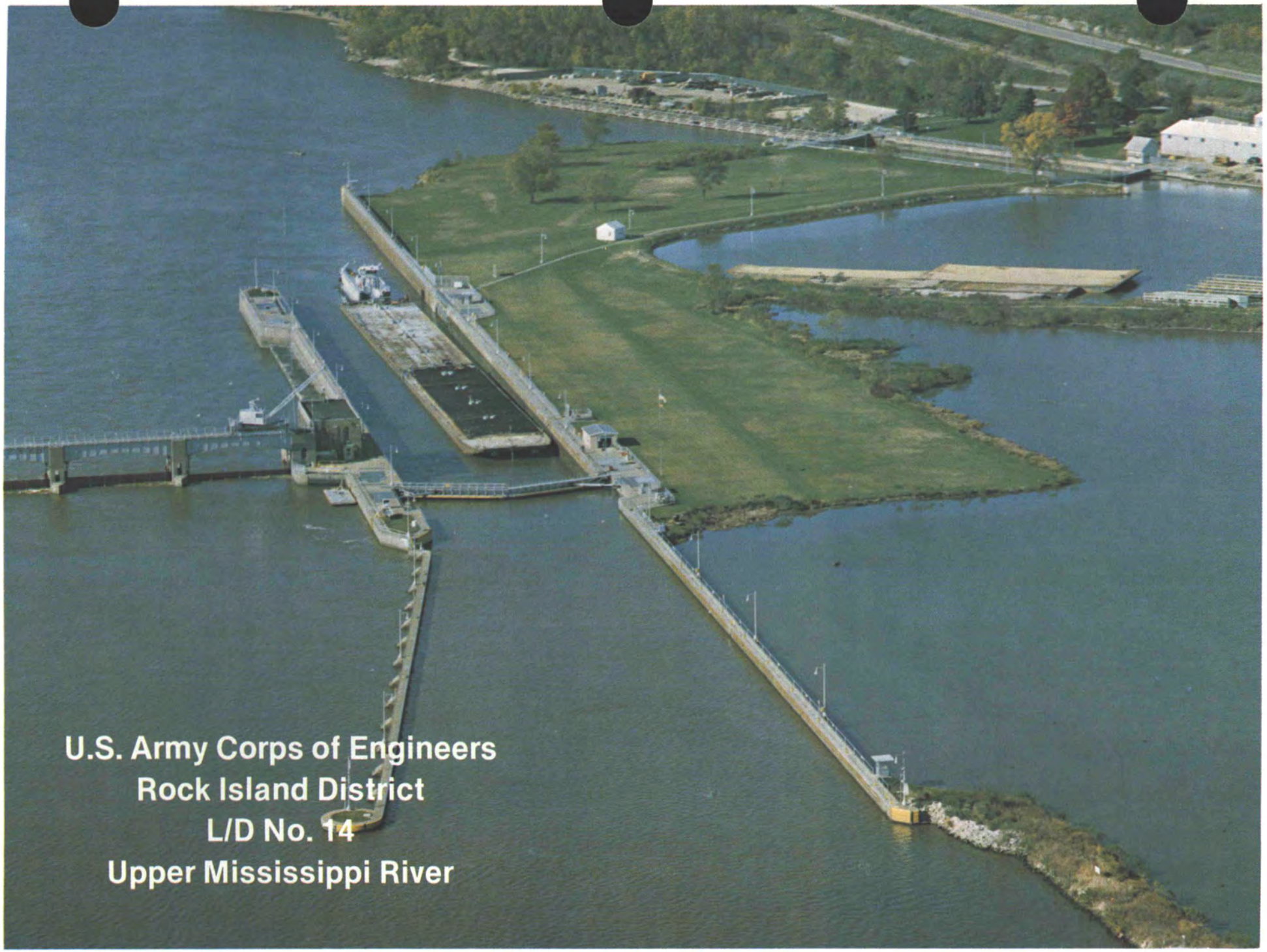
Lock & Dam 14 is one of the 12 navigation structures operated by the Rock Island District. It is located 1.0 mile upstream from Pleasant Valley, Iowa. Construction began in August 1935 and was completed in June 1939, at a cost of $6,145,000.

The dam has a total length of 2703 feet. The movable gate section is 1343 feet long and consists of 17 gates; 4 roller gates and 13 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 4 of these towers at the dam, one housing operating machinery for each of the 4 gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 1360-foot dike of earth and sand fill.

Boats going upstream enter the 600-foot-long and 110-foot-wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 11.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the upper right hand corner of the picture is the old LeClaire Lock and the downstream approach to the LeClaire Canal which was built as part of the 6-foot channel project on the Upper Mississippi River. Construction began in 1921 and was opened to navigation in November of 1922 at a project cost of $2,200,000. In 1930, Congress authorized the 9-foot channel and, as part of this project, Lock and Dam 14 was built, making the LeClaire Canal and Lock obsolete. When Lock 14 was opened to navigation, the LeClaire Canal and Lock was closed to commercial and recreational navigation. As recreational boating became more popular, the decision was made that the LeClaire Lock should be reactivated. In May 1969, after 30 years of being closed to public navigation, the old LeClaire Lock was reopened for recreational traffic only. The LeClaire Lock is 320 feet long by 80 feet wide, and is open to recreational traffic on weekends and holidays from Memorial Day through the first weekend in October. In 1977, a total of 6,985 recreational crafts carrying 24,126 passengers passed through the old LeClaire Lock.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 14
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 14 (UMR Mile No. 493.3)

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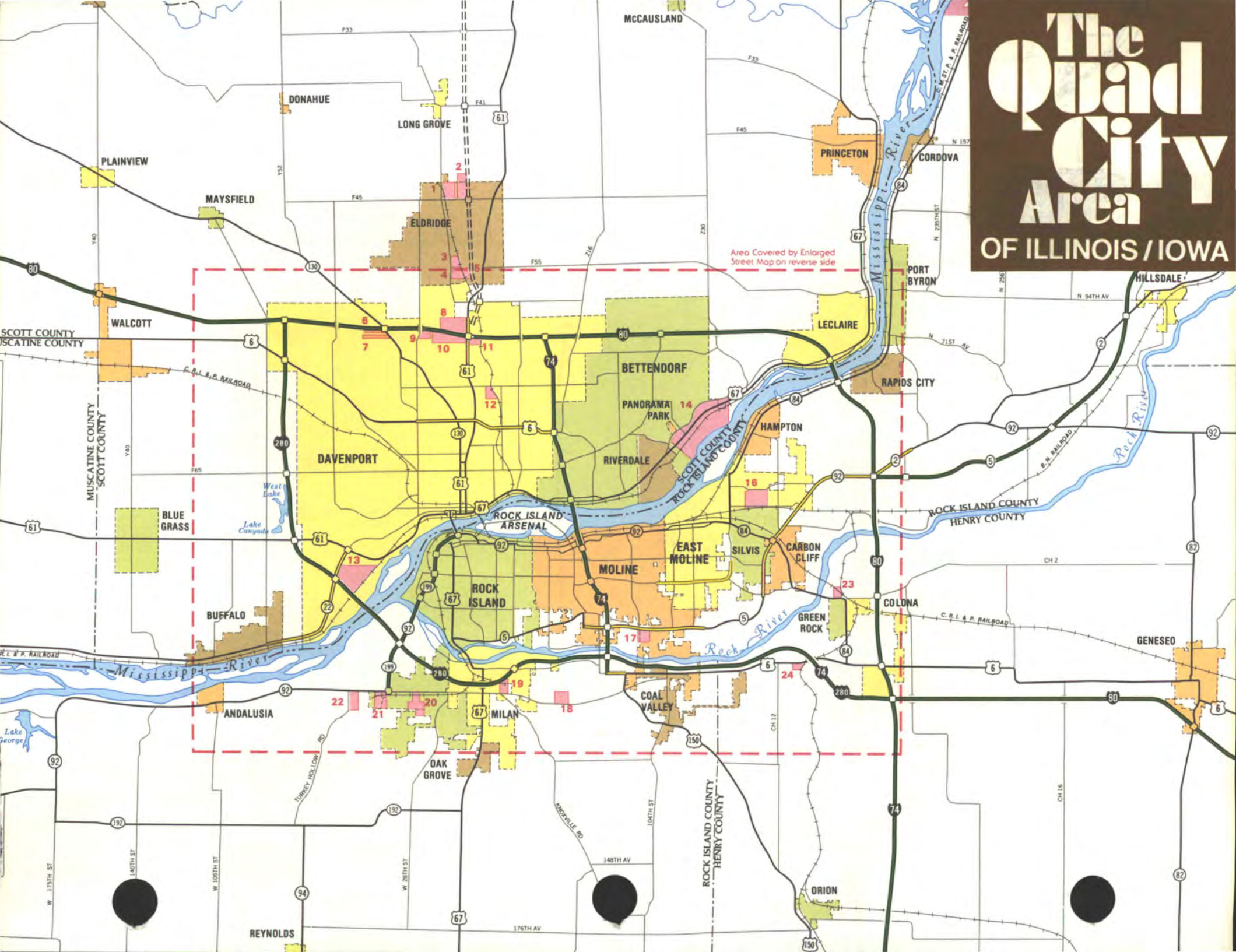
The Quad City Area

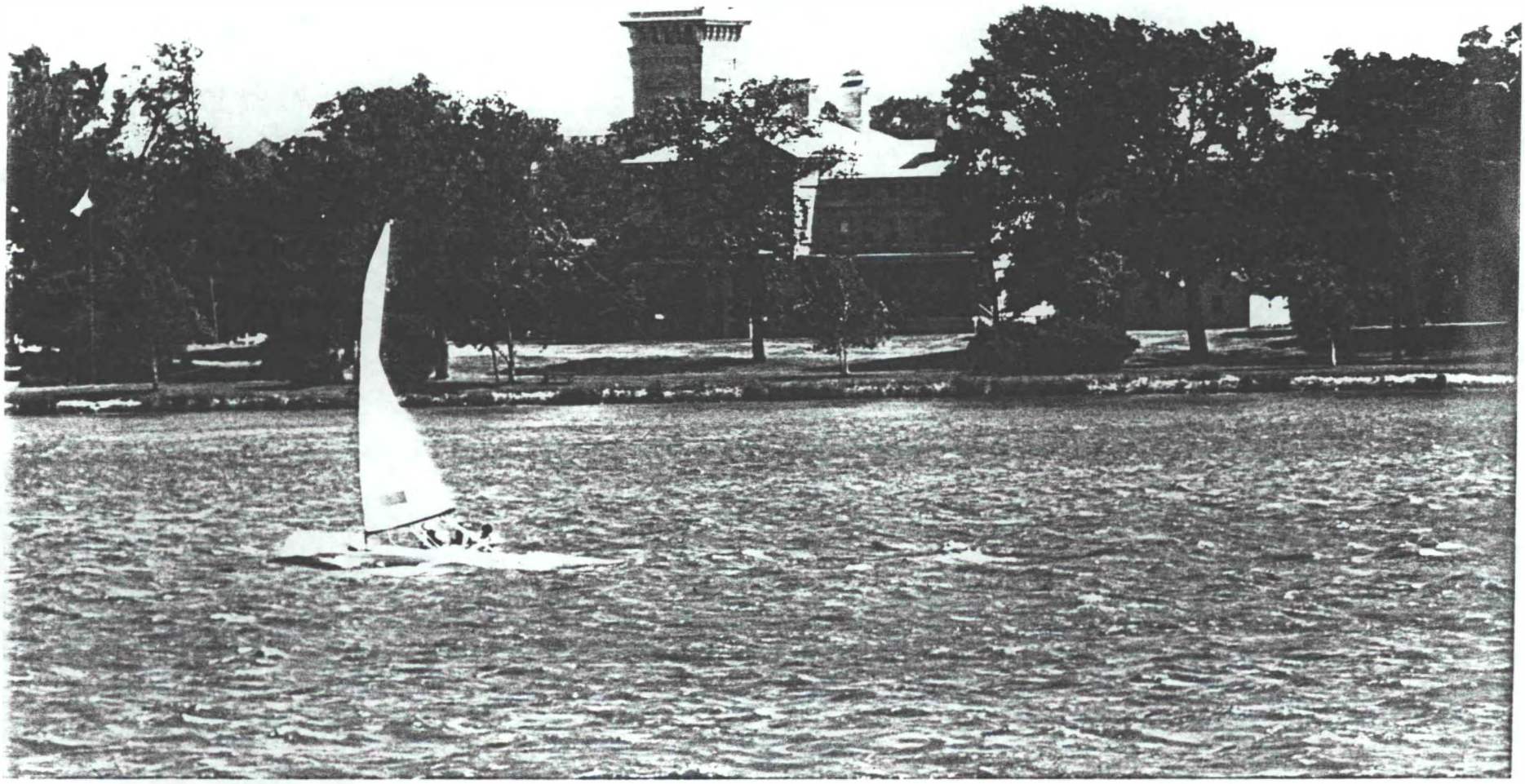
OF ILLINOIS / IOWA




DAVENPORT
BETTENDORF
AL AIRPORT
CHICAGO MILWAUKEE ST. PAUL & PACIFIC RAILROAD
MT JOY AVE
UTICA RIDGE
BARR ST
DEVIL'S GLEN RD
REST AREA
W 76TH ST
E 76TH ST
E 67TH ST
FORREST GROVE
HOPEWELL AVE
CROW VALLEY GOLF COURSE & COUNTRY CLUB
53RD AVE
E 53RD ST
JERSEY RIDGE RD
EASTERN AVE
BRADY ST
HARRISON ST
CROW CREEK PARK
CROW CREEK RD
E 46TH ST
MOUNT CALVARY CATHOLIC CEMETERY
DAVENPORT MEMORIAL PARK CEMETERY
MT. NEBO HEBREW CEM
PINE HILL CEMETERY
KIMBERLY RD
TANGLEFOOT LN
TANGLEWOOD
MIDDLE RD
BELMONT
DAVENPORT OSTEOPATHIC HOSPITAL
VOCATIONAL EDUCATION CENTER
DUCK CREEK PARKWAY
GARFIELD PARK
OAKDALE CEMETERY
ANNIE WITTENMYER CIVIC ACTIVITY CENTER & LIBRARY
ST. VINCENTS HOME
VANDER VEER PARK
DUCK CREEK PARK & GOLF COURSE
PALMER HILLS GOLF COURSE
MIDDLE PARK
HOOVER PARK
PUBLIC LIBRARY
PLEASANT VALLEY
SCOTT COMMUNITY COL
RIVERDALE
SPRUCE HILLS DR
E 35TH ST
E 29TH ST
CENTRAL PARK AVE
LOMBARD

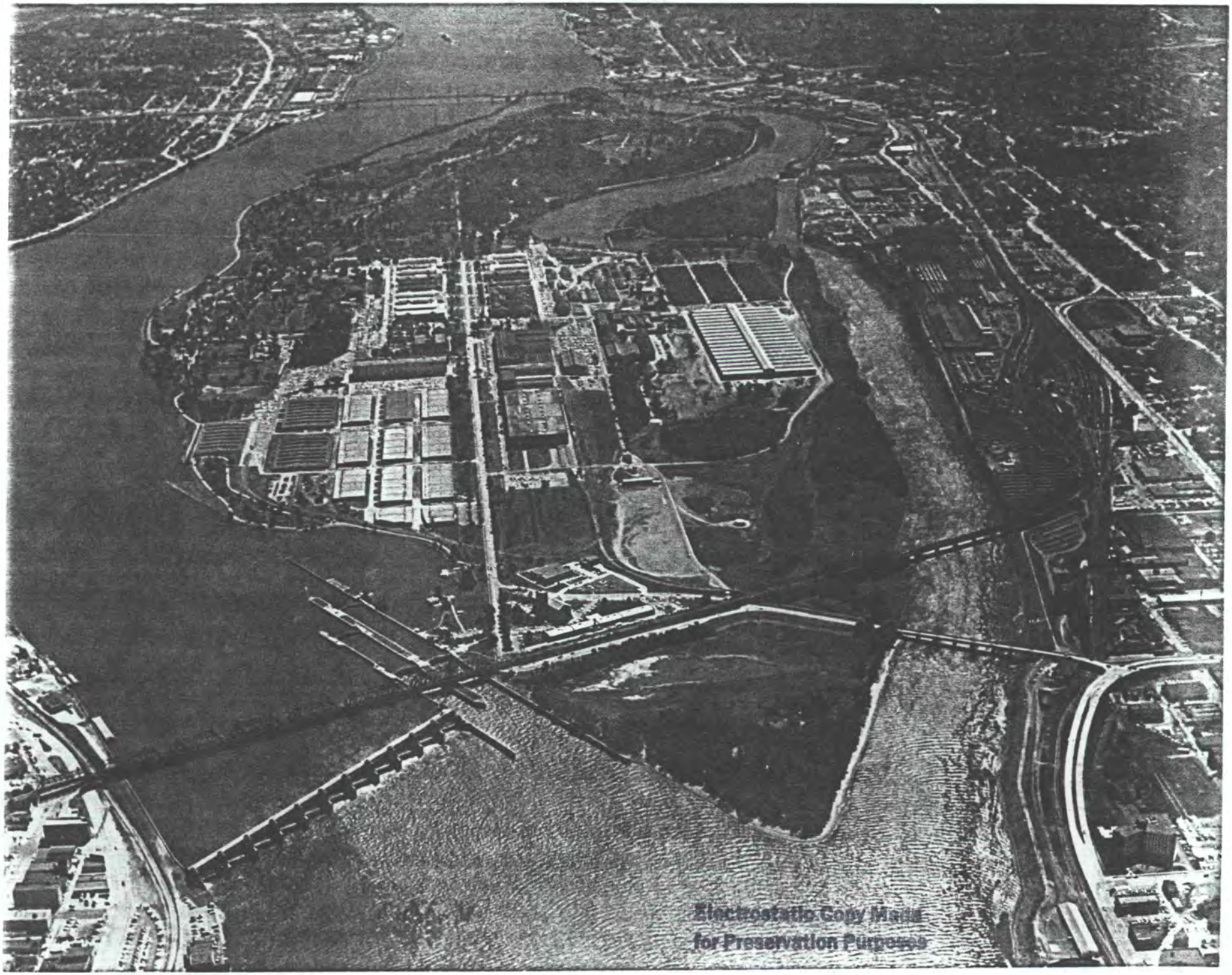
Quad-City Area

The Quad-Cities is a three county metropolitan area, which had a 1970 official population of 362,000. The Quad-Cities is a label for twelve contiguous municipalities . . . Davenport, Bettendorf, Eldridge and Riverdale in Iowa, and Rock Island, Moline, East Moline, Milan, Silvis, Coal Valley, Carbon Cliff and Hampton in Illinois . . . which is the second most important center in the two states. It is the largest metropolitan area on the Mississippi River between St. Louis and Minneapolis-St. Paul. The quad stands for a multiple clustering of several municipalities. The Quad-Cities also refers to the major metropolitan center located on the Quadrangle created by the beltline of Interstates 80 and 280. Rock Island Arsenal Island is located in the middle of the Quad-Cities and this area is also known as the farm implement center of the United States. Deere and Company has their world headquarters here and Caterpillar Tractor Company, J. I. Case Co. and International Harvester Company all have major plants in the Quad-Cities.



Sailing off Arsenal Island

Many recreational craft also use the Mississippi River, especially on weekends. These boats come from three marinas in the Quad-City area and many more are brought to the river in boat trailers. Many of these boats pass through the auxiliary lock at Locks and Dam No. 15 at the west end of Arsenal Island in the Quad-Cities. Many sailboats are kept at the Lake Davenport Sailing Club, where the "Delta Queen" moors, and this club holds sailboat regattas on the wide section of the river above the lock and dam.



ROCK ISLAND ARSENAL

Rock Island Arsenal occupies a 946-acre Island in the Mississippi River between Rock Island, IL and Davenport, IA. The Arsenal employs more than 2700 personnel with 72% classified as professional, technical, or skilled.

The Arsenal has evolved over the past 100 years into a center of technical excellence for weaponry and related equipment. Manufacturing operations are geared to prototype assistance, limited production orders, and orders for the production of critical repair parts. Artillery components, recoil mechanisms, gun mounts and carriages, loaders, grenade launchers, aircraft weapons subsystems and small arms are just a few of the items for which the Arsenal is recognized as a leading producer.

15

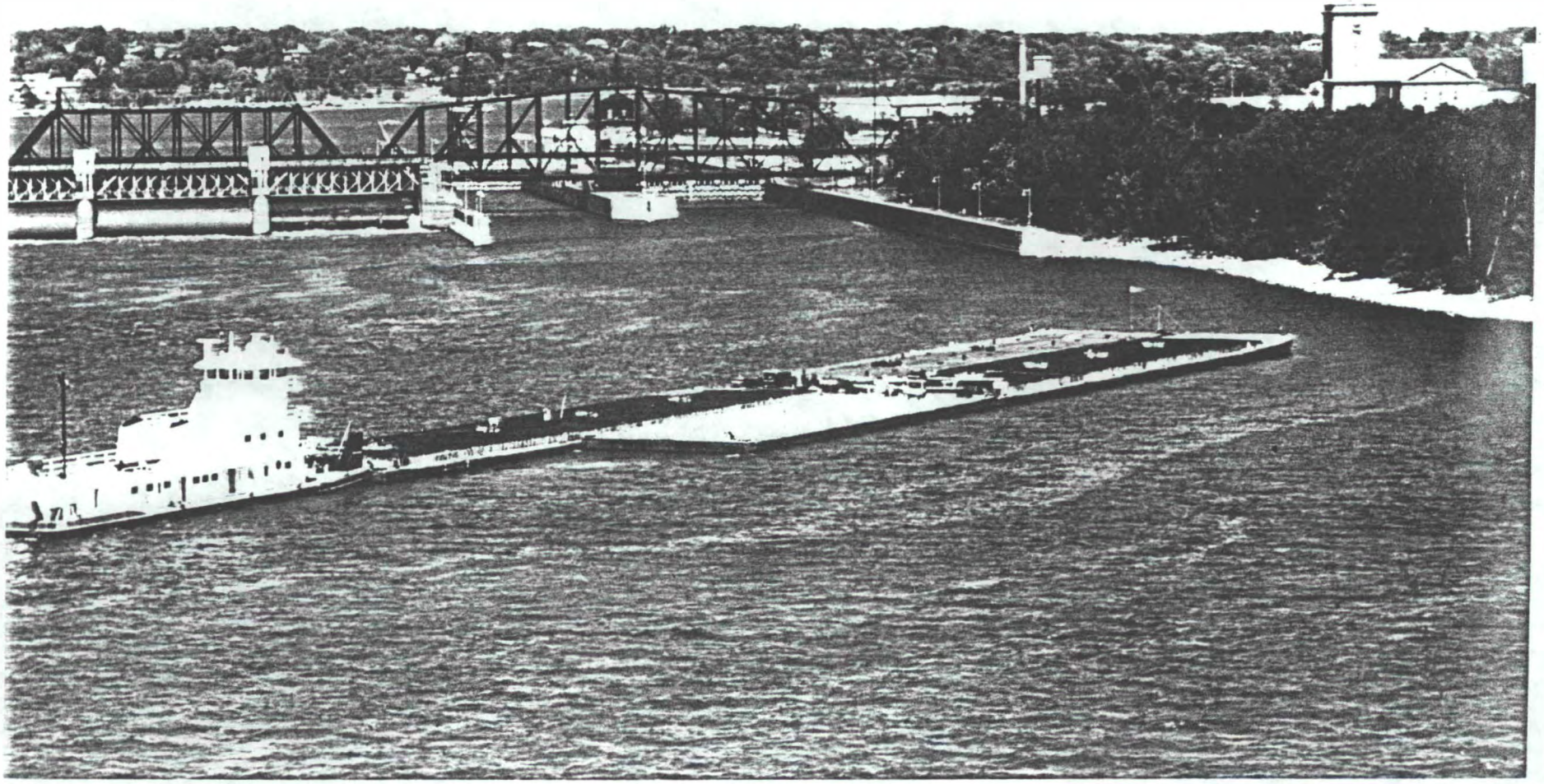
The manufacturing arm also includes facilities for casting ferrous and non-ferrous metals; for sheet metal piercing and forming; and for forging, welding, plating and painting operations. The assembly of equipment kits for self-propelled artillery, tanks, and reconnaissance vehicles is another major program. It is the only Government installation in the U.S. authorized to demilitarize small arms weapons and components.

Rock Island Arsenal serves as host to its parent command, the Army Armament Materiel Readiness Command (ARRCOM). The ARRCOM complex consists of four active arsenals, 29 Army ammunition facilities and support activities throughout the U.S.

The command is responsible for the production, provisioning and readiness of "guns and bullets" on a worldwide basis for the Army. ARRCOM's materiel assignments include artillery, infantry, rocket and missile warhead sections; demolition munitions; offensive and defensive chemical materiel; and the related training equipment, tools and test equipment. In addition to its Army support, ARRCOM is the single manager for the procurement, production, supply and maintenance of conventional ammunition for all U.S. military services.

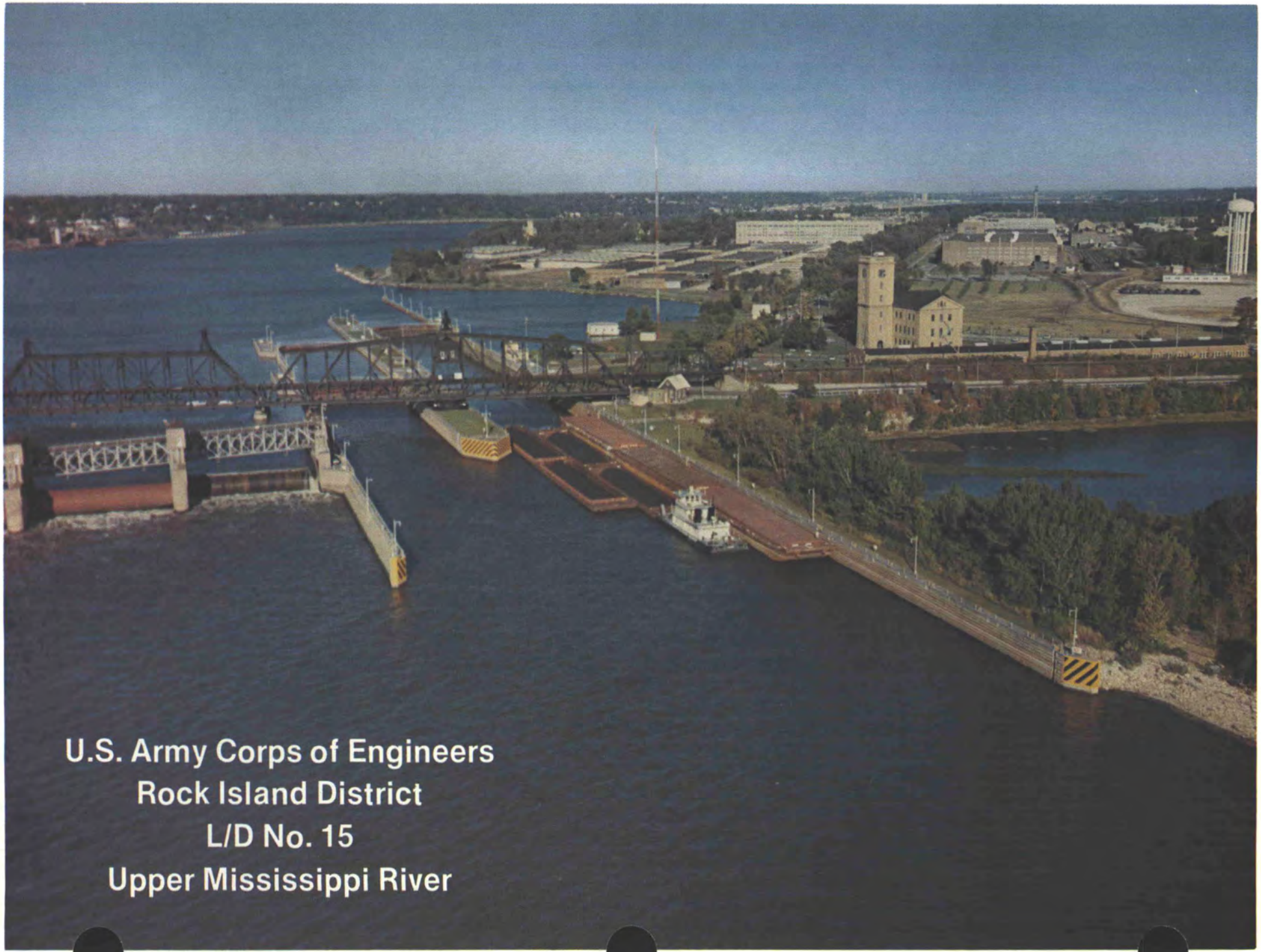
Arsenal Island hosts nearly twenty other Federal agency field offices and facilities. These include the Army Corps of Engineers, Army Management Engineering Training Agency, the Navy and Marine Corps Reserve Training Center, and the Rock Island National Cemetery. Over 7000 area residents work on Arsenal Island, second largest workforce in the Quad-Cities area.

Attractions on the Island include the Browning Museum, Lock and Dam 15, Fort Armstrong historic site, Confederate Cemetery and a scenic eight-mile public bike trail.



Rock Island District Headquarters

The headquarters of the Rock Island District of the US Army Corps of Engineers is located in the historic Clock Tower Building, which is on the west end of Arsenal Island near Locks and Dam No. 15. The Clock Tower was the first building built for Rock Island Arsenal and is on the National Register of Historic Places. The Clock Tower was completed in 1867 and was used as a warehouse by the Rock Island Arsenal until 1934, when it was converted into the Corps of Engineers headquarters for this area. The Corps of Engineers is also building a Visitor Center to serve the public visiting Locks and Dam No. 15. This Visitor Center will have indoor and outdoor observation areas and a museum.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 15
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCKS & DAM NO. 15 (UMR Mile No. 482.9)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

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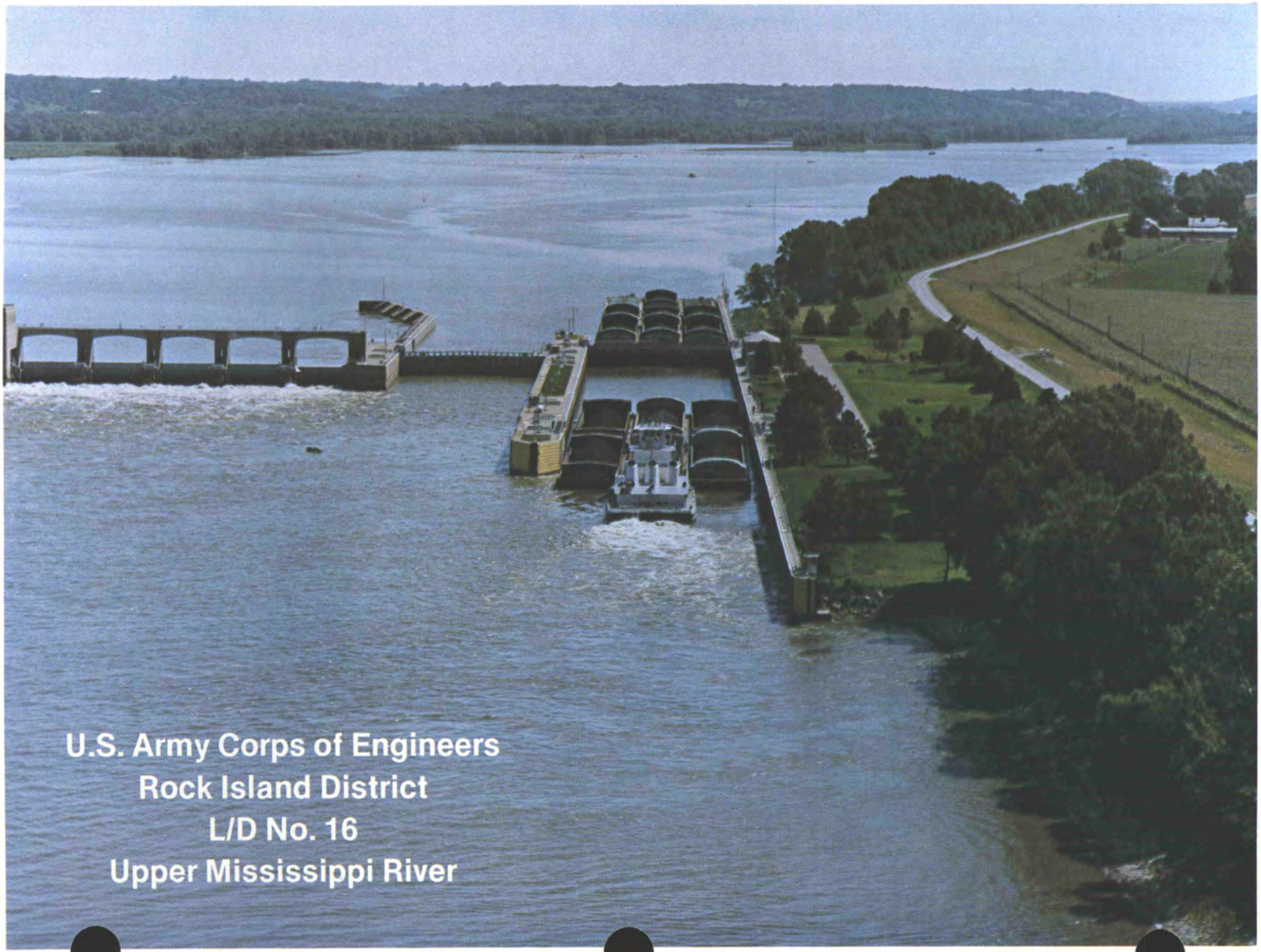
Locks and Dam No. 15 at Rock Island, Illinois, was the first installation built as part of the 9-foot channel project. The locks were built first, with construction beginning in April 1931 and being completed in December 1932. Work on the dam began in March 1932 and was completed in May 1934, at a cost of $9,725,000.

Dam No. 15 which is 1203 feet long, consists of eleven 100 foot long roller gates. There are eleven control houses at Dam No. 15, each one housing operating machinery for the roller gates. From the bottom of the river to the top of the control house is 78 feet. Dam No. 15 is unique in that it is made up entirely of roller gates. Other dams on the Mississippi River are made up of a combination of both roller gates and tainter gates. This dam was also built on an angle to gain additional gates as the river is quite narrow at this point.

Dam No. 15 is one of the more important structures in the whole scheme of the nine-foot channel in that it raised the water level over the section of water known as the "Rock Island Rapids," one of the hazardous reaches initially surveyed by Lt. Robert E. Lee in 1837. It is one of the historic sites of the Upper Mississippi River. Nearby was the village of Chief Blackhawk and the Sauk Indians. Fort Armstrong was located on the downstream tip of the present Arsenal Island. Lt. Zebulon M. Pike, leading an exploring party for the Lewis and Clarke expedition, landed in Davenport in 1804. The Clock Tower Building, the first building constructed on Arsenal Island in 1864-67, and now headquarters for the Rock Island District of the Corps of Engineers, is also within view of the locks and dam. The first bridge across the Mississippi was built here in 1856 and was located 500 feet upstream of the present locks.

On the Illinois, or island side of the Dam are Locks No. 15. Locks No. 15, just as Dam No. 15, is unique in that it is the only installation in the Rock Island District and one of four on the UMR constructed with two complete parallel locks. The two locks are both 110 feet wide; however, the lock nearest Arsenal Island is 600 feet long while the riverward lock is smaller — only 360 feet long. The vertical difference between the upper and lower pool called the "lift" is 16.0 feet.

Boats going upstream enter the lock at the lower pool. The gates are closed behind them and the lock fills with water by gravity from the upper pool thru a system of valves and tunnels. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 16
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 16 (UMR MILE NO. 457.2)

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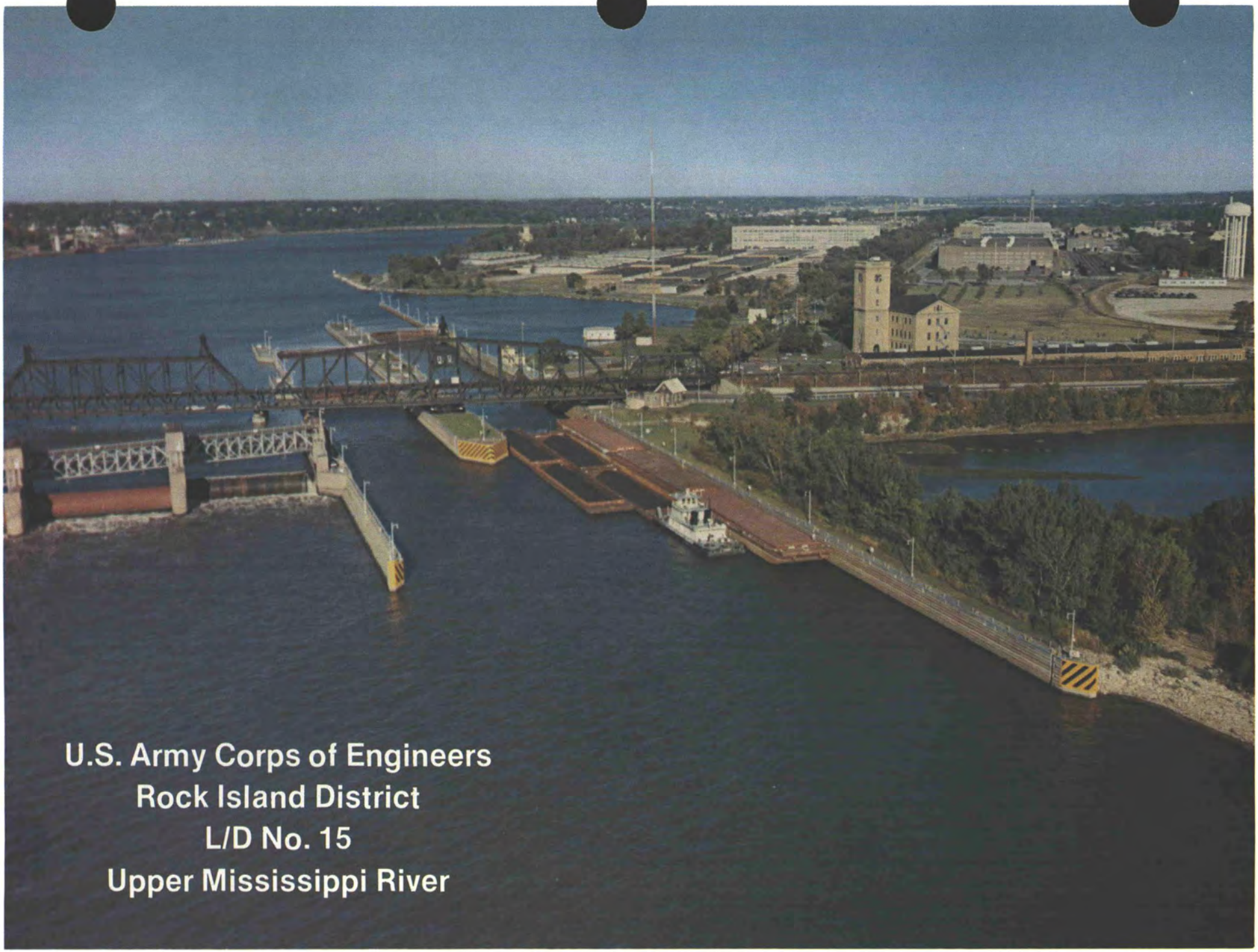
Lock & Dam 16 is one of the 12 navigation structures operated by the Rock Island District. It is located 1.8 miles upstream from Muscatine, Iowa. Construction began in December 1933 and was completed in July 1937, at an estimated cost of $3,981,000.

The dam has a total length of 3,940 feet. The movable gate section is 1,099 feet long and consists of 19 gates; 4 roller gates and 15 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 4 of these towers at the dam, one housing operating machinery for each of the 4 gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a hugh chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 1700-foot concrete spillway and two earthen dikes totaling 1141 feet.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 9.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow with 15 barges is shown locking upstream. These "jumbo" barges are 35 feet wide by 195 feet long. This tow is 3 barges wide for a total width of 105 feet. Thus, the pilot has only 5 additional feet to maneuver the tow into the lock chamber. The picture illustrates the close quarters. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 15
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCKS & DAM NO. 15 (UMR Mile No. 482.9)

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Locks and Dam No. 15 at Rock Island, Illinois, was the first installation built as part of the 9-foot channel project. The locks were built first, with construction beginning in April 1931 and being completed in December 1932. Work on the dam began in March 1932 and was completed in May 1934, at a cost of $9,725,000.

Dam No. 15 which is 1203 feet long, consists of eleven 100 foot long roller gates. There are eleven control houses at Dam No. 15, each one housing operating machinery for the roller gates. From the bottom of the river to the top of the control house is 78 feet. Dam No. 15 is unique in that it is made up entirely of roller gates. Other dams on the Mississippi River are made up of a combination of both roller gates and tainter gates. This dam was also built on an angle to gain additional gates as the river is quite narrow at this point.

Dam No. 15 is one of the more important structures in the whole scheme of the nine-foot channel in that it raised the water level over the section of water known as the "Rock Island Rapids," one of the hazardous reaches initially surveyed by Lt. Robert E. Lee in 1837. It is one of the historic sites of the Upper Mississippi River. Nearby was the village of Chief Blackhawk and the Sauk Indians. Fort Armstrong was located on the downstream tip of the present Arsenal Island. Lt. Zebulon M. Pike, leading an exploring party for the Lewis and Clarke expedition, landed in Davenport in 1804. The Clock Tower Building, the first building constructed on Arsenal Island in 1864-67, and now headquarters for the Rock Island District of the Corps of Engineers, is also within view of the locks and dam. The first bridge across the Mississippi was built here in 1856 and was located 500 feet upstream of the present locks.

On the Illinois, or island side of the Dam are Locks No. 15. Locks No. 15, just as Dam No. 15, is unique in that it is the only installation in the Rock Island District and one of four on the UMR constructed with two complete parallel locks. The two locks are both 110 feet wide; however, the lock nearest Arsenal Island is 600 feet long while the riverward lock is smaller — only 360 feet long. The vertical difference between the upper and lower pool called the "lift" is 16.0 feet.

Boats going upstream enter the lock at the lower pool. The gates are closed behind them and the lock fills with water by gravity from the upper pool thru a system of valves and tunnels. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 17
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 17 (UMR MILE NO. 437.1)

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Lock & Dam 17 is one of the 12 navigation structures operated by the Rock Island District. It is located 4 miles upstream from New Boston, Illinois. Construction began in August 1935 and was completed in January 1939, at a cost of $5,832,000.

The dam has a total length of 3196 feet. The movable gate section is 921 feet long and consists of 11 gates—3 roller gates and 8 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each one housing operating machinery for a gate. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 1555 foot submersible dike and a 721 foot dike of earth and sand fill.

Boats going upstream enter the 600-foot-long and 110-foot-wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 8.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow with 15 barges is shown locking upstream. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened, as seen in the photograph. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 16
Upper Mississippi River

BUILDING TOMORROW TODAY

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Lock & Dam 16 is one of the 12 navigation structures operated by the Rock Island District. It is located 1.8 miles upstream from Muscatine, Iowa. Construction began in December 1933 and was completed in July 1937, at an estimated cost of $3,981,000.

The dam has a total length of 3,940 feet. The movable gate section is 1,099 feet long and consists of 19 gates; 4 roller gates and 15 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 4 of these towers at the dam, one housing operating machinery for each of the 4 gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a hugh chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 1700-foot concrete spillway and two earthen dikes totaling 1141 feet.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 9.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow with 15 barges is shown locking upstream. These "jumbo" barges are 35 feet wide by 195 feet long. This tow is 3 barges wide for a total width of 105 feet. Thus, the pilot has only 5 additional feet to maneuver the tow into the lock chamber. The picture illustrates the close quarters. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.

U.S. Army Corps of Engineers
Rock Island District
L/D No. 18
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 18 (UMR MILE NO. 410.5)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 25,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 18 is one of the 12 navigation structures operated by the Rock Island District. It is located 5.5 miles downstream from Oquawka, Illinois. Construction began in November 1933 and was completed in September 1937, at an estimated cost of $9,158,000.

The dam has a total length of 7,020 feet. The movable gate section is 1,350 feet long and consists of 17 gates; 3 roller gates and 14 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each one housing operating machinery for a gate. The machinery in the control houses raises and lowers the gates, as necessary, by means of a hugh chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 2200-foot concrete submersible dike and a 3470-foot dike of earth and sand fill.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 10.5 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture an upbound petroleum tow with 4 tank barges carrying 3.4 to 4 million gallons of gasoline is shown departing the lock. This single string of barges is close to 600 feet long. Since this is almost the length of the lock, the boat must uncouple from the barge, come up, and tie off alongside the stern barge in the lock chamber. This is called a "setover." After the tow has been signaled to leave the lock, the pilot will move the tow up along the lock wall until there is enough room between the barges and lower lock gates to drop the boat back to its original position at the rear of the barges or "string." The boat then couples with the stern barge and continues its journey.

Another tow is waiting to lock upstream along the lower guidewall. A third tow pushing petroleum barges is waiting its turn at the lower approach point to the lock.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 17
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 17 (UMR MILE NO. 437.1)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 837.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was complete, both commercial and recreation river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 29,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 17 is one of the 12 navigation structures operated by the Rock Island District. It is located 4 miles upstream from New Boston, Illinois. Construction began in August 1935 and was completed in January 1939, at a cost of $5,832,000.

The dam has a total length of 3196 feet. The movable gate section is 921 feet long and consists of 11 gates—3 roller gates and 8 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each one housing operating machinery for a gate. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 1555 foot submersible dike and a 721 foot dike of earth and sand fill.

Boats going upstream enter the 600-foot-long and 110-foot-wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 8.0 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow with 15 barges is shown locking upstream. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened, as seen in the photograph. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 18
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 18 (UMR MILE NO. 410.5)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 25,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 18 is one of the 12 navigation structures operated by the Rock Island District. It is located 5.5 miles downstream from Oquawka, Illinois. Construction began in November 1933 and was completed in September 1937, at an estimated cost of $9,158,000.

The dam has a total length of 7,020 feet. The movable gate section is 1,350 feet long and consists of 17 gates; 3 roller gates and 14 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each one housing operating machinery for a gate. The machinery in the control houses raises and lowers the gates, as necessary, by means of a hugh chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam consists of a 2200-foot concrete submersible dike and a 3470-foot dike of earth and sand fill.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 10.5 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture an upbound petroleum tow with 4 tank barges carrying 3.4 to 4 million gallons of gasoline is shown departing the lock. This single string of barges is close to 600 feet long. Since this is almost the length of the lock, the boat must uncouple from the barge, come up, and tie off alongside the stern barge in the lock chamber. This is called a "setover." After the tow has been signaled to leave the lock, the pilot will move the tow up along the lock wall until there is enough room between the barges and lower lock gates to drop the boat back to its original position at the rear of the barges or "string." The boat then couples with the stern barge and continues its journey.

Another tow is waiting to lock upstream along the lower guidewall. A third tow pushing petroleum barges is waiting its turn at the lower approach point to the lock.


U.S. Army Corps of Engineers
Rock Island District
Lock No. 19
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK NO. 19 (UMR Mile No. 364.2)

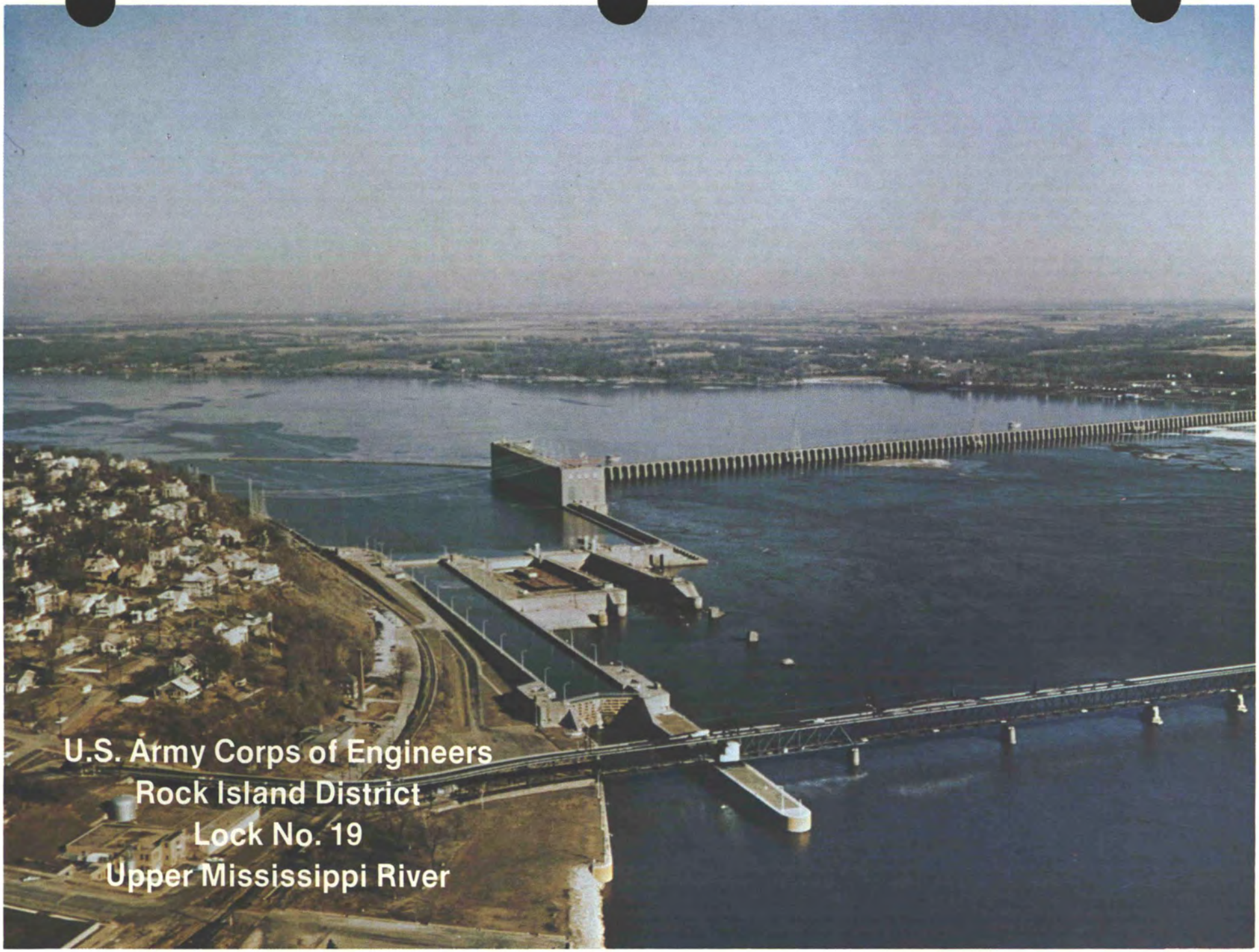
The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U.S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 26,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock 19 is one of the 12 navigation structures operated by the Rock Island District. It is located at Keokuk, Iowa. Construction began in December 1952 and was completed in May 1957, at a cost of $12,909,000.

The new lock, founded on rock, has a usable length of 1200 feet and a width of 110 feet. The land and river walls of the lock extend well downstream beyond the lock proper to assist in guiding traffic into the lock. The lower lock gate is a conventional miter gate, while the upper service gate is a submergible lift gate. Upstream from the upper service gate is a submergible vertical-lift guard gate to serve as an emergency gate in case of failure of the service gate. The guard gate is provided with seals so that it can function as a part of the lock unwatering system. Additionally, this gate serves as a bridge in the roadway to the drydock, the old lock, and the powerhouse. Boats going upstream enter the lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 38.2 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In 1905 the Mississippi River Power Company (now the Union Electric Power Company) was authorized to construct a hydroelectric plant with a dam, powerhouse, lock, and drydock with several appurtenant buildings, at Keokuk. These structures, with exception of the dam and powerhouse, were turned over to the United States upon their completion in 1913. The old lock and drydock seen to the right of the 1200-foot lock in the picture are no longer in use. The old lock at Keokuk, 358 feet by 110 feet—as compared with the 600-foot by 110-foot locks built elsewhere on the Upper Mississippi River and the 1200-foot by 110-foot lock constructed at Chain of Rocks near St. Louis, Missouri—was an impediment to river traffic in the 9-foot channel project. Delays up to 3 days were experienced by the large, streamlined modern tows when they reach this small, slow-operating lock. The 1200-foot lock eliminated this problem.


U.S. Army Corps of Engineers
Rock Island District
Lock No. 19
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK NO. 19 (UMR Mile No. 364.2)

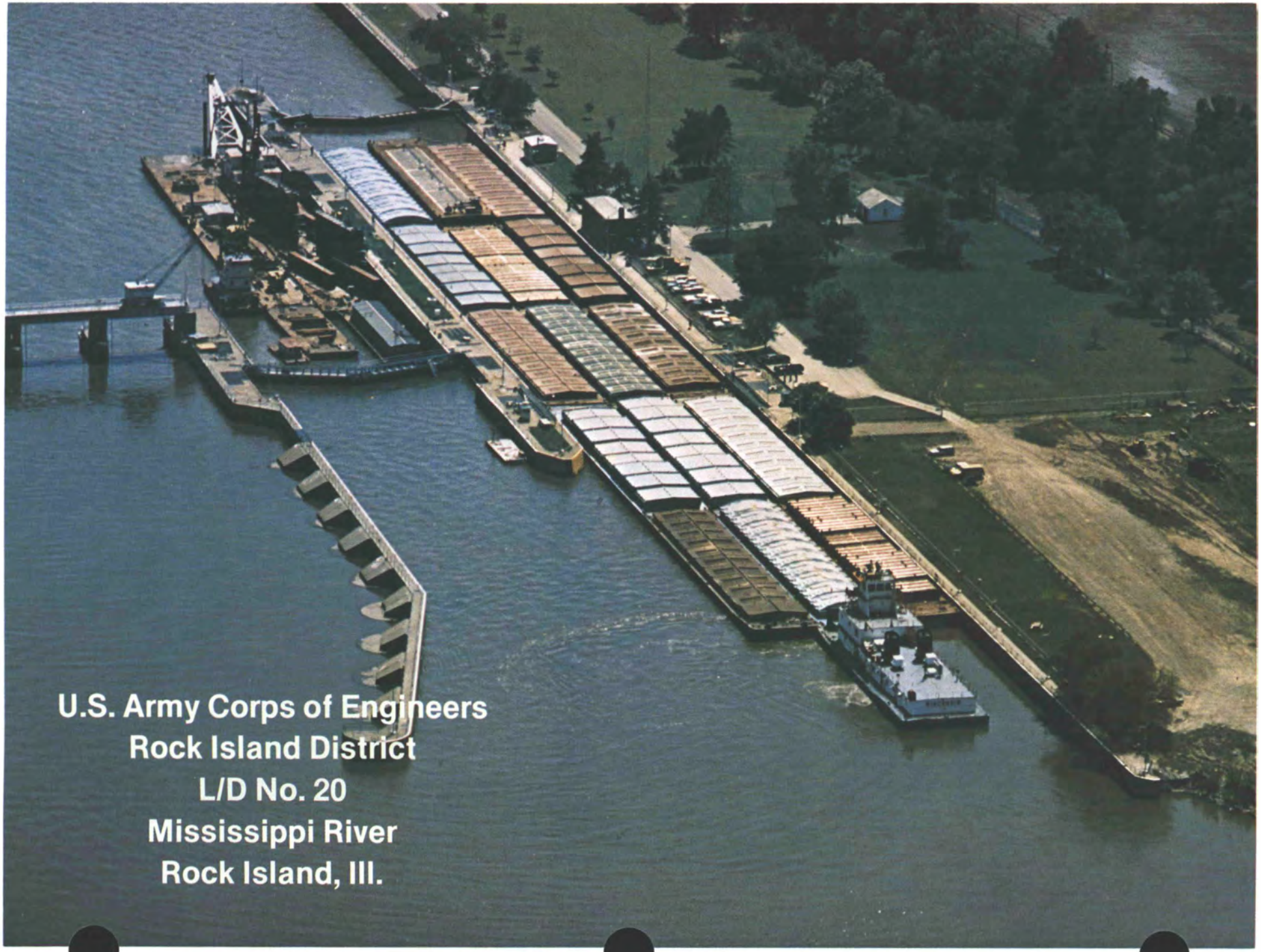
The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U.S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 26,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock 19 is one of the 12 navigation structures operated by the Rock Island District. It is located at Keokuk, Iowa. Construction began in December 1952 and was completed in May 1957, at a cost of $12,909,000.

The new lock, founded on rock, has a usable length of 1200 feet and a width of 110 feet. The land and river walls of the lock extend well downstream beyond the lock proper to assist in guiding traffic into the lock. The lower lock gate is a conventional miter gate, while the upper service gate is a submergible lift gate. Upstream from the upper service gate is a submergible vertical-lift guard gate to serve as an emergency gate in case of failure of the service gate. The guard gate is provided with seals so that it can function as a part of the lock unwatering system. Additionally, this gate serves as a bridge in the roadway to the drydock, the old lock, and the powerhouse. Boats going upstream enter the lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 38.2 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In 1905 the Mississippi River Power Company (now the Union Electric Power Company) was authorized to construct a hydroelectric plant with a dam, powerhouse, lock, and drydock with several appurtenant buildings, at Keokuk. These structures, with exception of the dam and powerhouse, were turned over to the United States upon their completion in 1913. The old lock and drydock seen to the right of the 1200-foot lock in the picture are no longer in use. The old lock at Keokuk, 358 feet by 110 feet—as compared with the 600-foot by 110-foot locks built elsewhere on the Upper Mississippi River and the 1200-foot by 110-foot lock constructed at Chain of Rocks near St. Louis, Missouri—was an impediment to river traffic in the 9-foot channel project. Delays up to 3 days were experienced by the large, streamlined modern tows when they reach this small, slow-operating lock. The 1200-foot lock eliminated this problem.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 20
Mississippi River
Rock Island, Ill.

BUILDING TOMORROW TODAY

LOCK & DAM NO. 20 (UMR Mile No. 343.2)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or downstream.

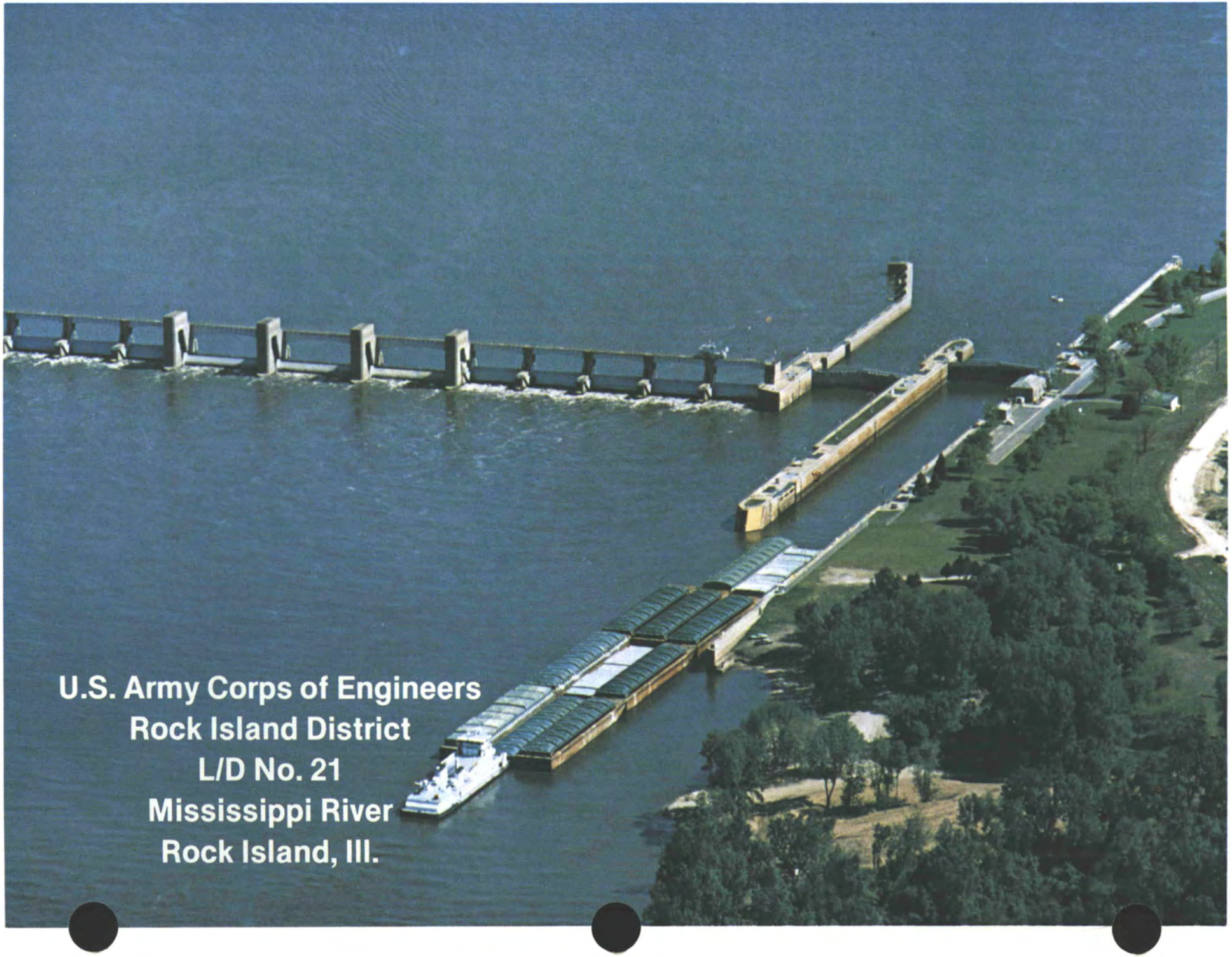
There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300.0 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to over 25,000,000 tons in 1976. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 20, which is one of the 12 navigation structures operated by the Rock Island District, is located one mile upstream from Canton, Missouri. Construction of this facility began in November, 1933 and was completed in April 1936, at a cost of $6,152,000.

The 2144-foot dam consists of 43 gates, 3 roller gates and 40 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each housing operating machinery for one of the 3 gates. The machinery in the control towers raise and lower the gates, as necessary (by means of a huge chain). The tainter gates of the dam differ in shape and method of operation from the larger roller gates. Rather than being round, as are the roller gates, the tainter gates have a curved surface. Chains operated by motors at each end of these gates are used to raise and lower the roller gates and 2 of the tainter gates. The remaining 38 tainter gates do not have motors. They are operated by a locomotive hoist car which moves along rails on the dam service bridge. The hoist car moves the gates up or down by lowering a set of chains and attaching them to individual gates.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat the maximum of 10.0 feet. The upper gates are then opened and the boat proceeds on its way. The process is reversed for boats going downstream.

In the picture a tow with 15 barges is shown "locking through" downstream. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, one to nine barges are uncoupled from the tow. The boat then backs upstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled downstream out of the lock chamber by an electrically driven winch after the lock has been emptied and the lower gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again emptied and the lower lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its downstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 21
Mississippi River
Rock Island, Ill.

BUILDING TOMORROW TODAY

LOCK & DAM NO. 21 (UMR Mile No. 324.9)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 25,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 21 is one of the 12 navigation structures operated by the Rock Island District. It is located 2 miles downstream from Quincy, Illinois. Construction began in January 4 and was completed in July 1938, at a cost of $5,250,000.

The dam has a total length of 2956 feet. The movable gate section is 1066 feet long and consists of 13 gates, 3 roller gates and 10 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, one housing operating machinery for each of the 3 roller gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. Chains operated by motors at each end of these gates are used to raise and lower the gates. The rest of the dam consists of two dikes totaling 1,890 feet.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 10.5 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow heading upstream with 11 barges is shown entering the lock. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 20
Mississippi River
Rock Island, Ill.

BUILDING TOMORROW TODAY

LOCK & DAM NO. 20 (UMR Mile No. 343.2)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or downstream.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300.0 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to over 25,000,000 tons in 1976. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 20, which is one of the 12 navigation structures operated by the Rock Island District, is located one mile upstream from Canton, Missouri. Construction of this facility began in November, 1933 and was completed in April 1936, at a cost of $6,152,000.

The 2144-foot dam consists of 43 gates, 3 roller gates and 40 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each housing operating machinery for one of the 3 gates. The machinery in the control towers raise and lower the gates, as necessary (by means of a huge chain). The tainter gates of the dam differ in shape and method of operation from the larger roller gates. Rather than being round, as are the roller gates, the tainter gates have a curved surface. Chains operated by motors at each end of these gates are used to raise and lower the roller gates and 2 of the tainter gates. The remaining 38 tainter gates do not have motors. They are operated by a locomotive hoist car which moves along rails on the dam service bridge. The hoist car moves the gates up or down by lowering a set of chains and attaching them to individual gates.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat the maximum of 10.0 feet. The upper gates are then opened and the boat proceeds on its way. The process is reversed for boats going downstream.

In the picture a tow with 15 barges is shown "locking through" downstream. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, one to nine barges are uncoupled from the tow. The boat then backs upstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled downstream out of the lock chamber by an electrically driven winch after the lock has been emptied and the lower gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again emptied and the lower lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its downstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 22
Upper Mississippi River

BUILDING TOMORROW TODAY

LOCK & DAM NO. 22 (UMR Mile No. 301.2)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

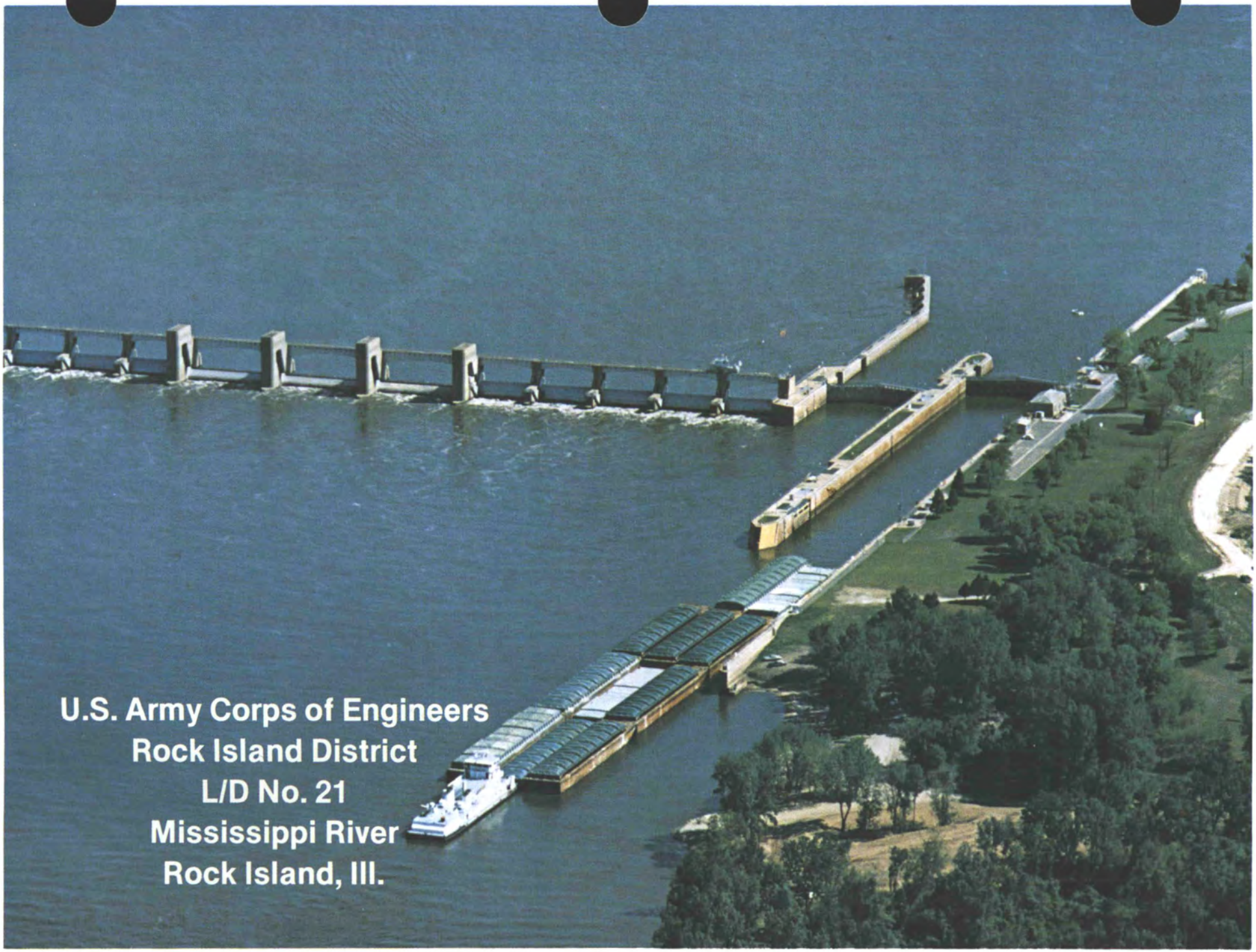
There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was complete, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 26,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

Lock & Dam 22 is one of the 12 navigation structures operated by the Rock Island District. It is located at Saverton, Missouri, a few miles downstream from Hannibal, Missouri, boyhood home of Samuel Clemens (Mark Twain). Construction began in January 1934 and was completed in July 1938, at a cost of $5,250,000.

The dam has a total length of 3084 feet. The movable gate section is 1024 feet long and consists of 13 gates — 3 roller gates and 10 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, each one housing operating machinery for a gate. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. The tainter gates are also moved by large chains through a gear reduction system powered by an electric motor located in the center of the gate bay, hidden from view under the service bridge over the dam. The rest of the dam is a 2060-foot-long dike of earth and sand fill.

Boats going upstream enter the 600-foot-long and 110-foot-wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 10.5 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow with 17 barges is shown locking upstream. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened, as seen in the photograph. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.


U.S. Army Corps of Engineers
Rock Island District
L/D No. 21
Mississippi River
Rock Island, Ill.

BUILDING TOMORROW TODAY

LOCK & DAM NO. 21 (UMR Mile No. 324.9)

The Mississippi River is divided for navigation purposes into two parts, the Lower Mississippi River and the Upper Mississippi River (UMR). The UMR extends from River Mile 0 at the confluence of the Ohio and Mississippi Rivers at Cairo, Illinois, to River Mile 857.6 at Minneapolis, Minnesota. In this reach of the river, 27 dams have been constructed to create a series of pools with a minimum water depth of nine feet. These dams changed the river into a series of "steps," which tows and pleasure craft climb or descend as they travel upstream or down.

There are 12 navigation structures operated by the Rock Island District, U. S. Army Corps of Engineers, in the reach of the UMR from Mile 300 to Mile 614.0. Since the present system of locks and dams was completed, both commercial and recreational river traffic has increased tremendously. Commercial traffic in the Rock Island District has increased from an annual tonnage of 1,000,000 in 1934, to presently over 25,000,000. Recreational traffic has increased from virtually nothing before World War II to over 20,000 lockages annually.

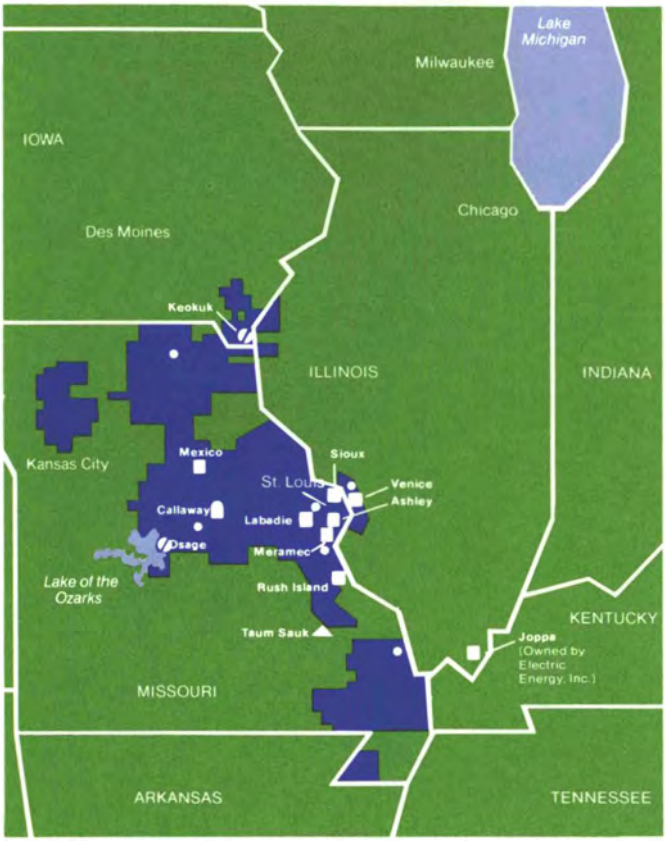
34

Lock & Dam 21 is one of the 12 navigation structures operated by the Rock Island District. It is located 2 miles downstream from Quincy, Illinois. Construction began in January 4 and was completed in July 1938, at a cost of $5,250,000.

The dam has a total length of 2956 feet. The movable gate section is 1066 feet long and consists of 13 gates, 3 roller gates and 10 tainter gates. The roller gates, the larger of the two types, are operated from control towers. There are 3 of these towers at the dam, one housing operating machinery for each of the 3 roller gates. The machinery in the control houses raises and lowers the gates, as necessary, by means of a huge chain. The tainter gates of the dam differ in shape and in their method of operation. Rather than being round, as are the roller gates, the tainter gates have a curved surface. Chains operated by motors at each end of these gates are used to raise and lower the gates. The rest of the dam consists of two dikes totaling 1,890 feet.

Boats going upstream enter the 600-foot long and 110-foot wide lock at the lower pool. The gates are closed behind them and the lock fills with water from the upper pool, lifting the boat a maximum of 10.5 feet. The upper gates then open and the boat proceeds on its way. This process is reversed for boats going downstream.

In the picture, a tow heading upstream with 11 barges is shown entering the lock. Since the length of the tow exceeds the length of the lock chamber, the tow must lock through in two locking operations. This is called a "double lockage." The tow first pushes the barges into the lock. Depending on the length of the tow, a number of barges are uncoupled from the tow. The boat then backs downstream out of the lock chamber with the remaining barges. The first part of the tow, known as the "first cut," is pulled upstream out of the lock chamber by an electrically driven winch after the lock has been filled and the upper gates opened. The locking cycle is then repeated for the boat and remaining barges. When the water in the lock is again raised and the upper lock gates opened, the boat and barges couple with the "first cut" or section of barges using steel cables called "wires." The tow then continues its upstream journey.



LEGEND

Area Served

Electric Generating Plants

- Fossil-Steam
- Hydro
- Pumped-Storage
- Combustion Turbine
- Nuclear (Under Construction)

LAKE KEOKUK

a world of fun and beauty!

Beautiful Lake Keokuk was formed when the dam was completed. It extends northward from the dam to Burlington, Iowa and comprises an area of over fifty square miles, varying in width from three-fourths of a mile to three miles.

Water skiing, motor boating, sailing and fishing are some of the popular water sports the lake provides. In addition to its recreational appeal, its picturesque setting is considered the most beautiful along the mighty river.

UNION Electric

WELCOME TO

UNION ELECTRIC'S KEOKUK HYDROELECTRIC POWER PLANT

KEOKUK PLANT HISTORY

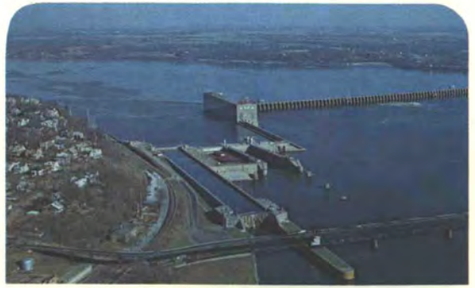
Although construction on the Keokuk dam and power plant began in 1910, the history of this site as a power source began as far back as 1836 when Robert E. Lee conducted a survey for the War Department. In his report he called attention to the power potential of this section of the Mississippi known as the Des Moines Rapids, the most turbulent stretch in the mighty river.

By 1848 the enterprising people of Keokuk organized a company to build a plant here to harness this power for operating textile and grain mills. Then, after Thomas Edison announced his discovery, this site became a natural for generation of electricity. Several proposals were made and franchises were granted, but none materialized until Hugh L. Cooper, who had engineered the installation of a plant at Niagara Falls, obtained an option on the project. Through a great deal of hard work and after a series of disappointments, his plans began to materialize when he made arrangements with the power company and street railway company in St. Louis to purchase the power that would be generated here. Two years later he secured a commitment from Stone & Webster to finance this daring project of building the largest power plant and dam in the world and the longest and highest voltage line to carry the energy to St. Louis.

The dam, which is seven-eighths of a mile long, and the power plant, which stands the equivalent of ten stories above the upper water level, were completed in 1913. The skill and competence of its builders is demonstrated by the fact that all of its original turbines are in use today. These properties were bought by Union Electric Company in 1925.

(continued on page 6)

Aerial view of the Keokuk Plant and the dam which spans the Mississippi River to harness the Des Moines Rapids.



Interior view of the power station, showing a part of the section which houses the 15 main turbines.

CENTRALIZED CONTROL

MOUND POWER PLANT

ASHLEY POWER PLANT

KEOKUK POWER PLANT

CAHOKIA POWER PLANT

OSAGE POWER PLANT

LABADIE POWER PLANT

SIOUX POWER PLANT

TAUM SAUK POWER PLANT

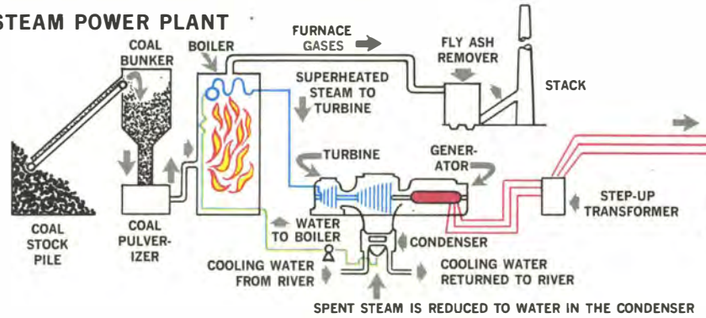
MERAMEC POWER PLANT

VENICE POWER PLANT

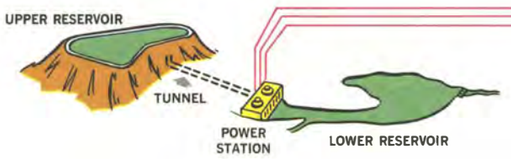
The Load Dispatching Office in St. Louis is the master control center of Union Electric's power operations. Here, by means of the most up-to-date electronic equipment, the amount of power needed by our customers can be determined, the amount generated at each of our ten plants can be controlled, and the route the power will take to reach the customers can be established. Also, the amount of power that can be sold or must be bought, through interconnections (power pools) with neighboring utilities, can be determined.

HOW ELECTRIC ENERGY IS GENERATED, TRANSMITTED AND DISTRIBUTED

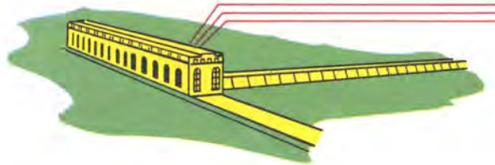
● STEAM POWER PLANT

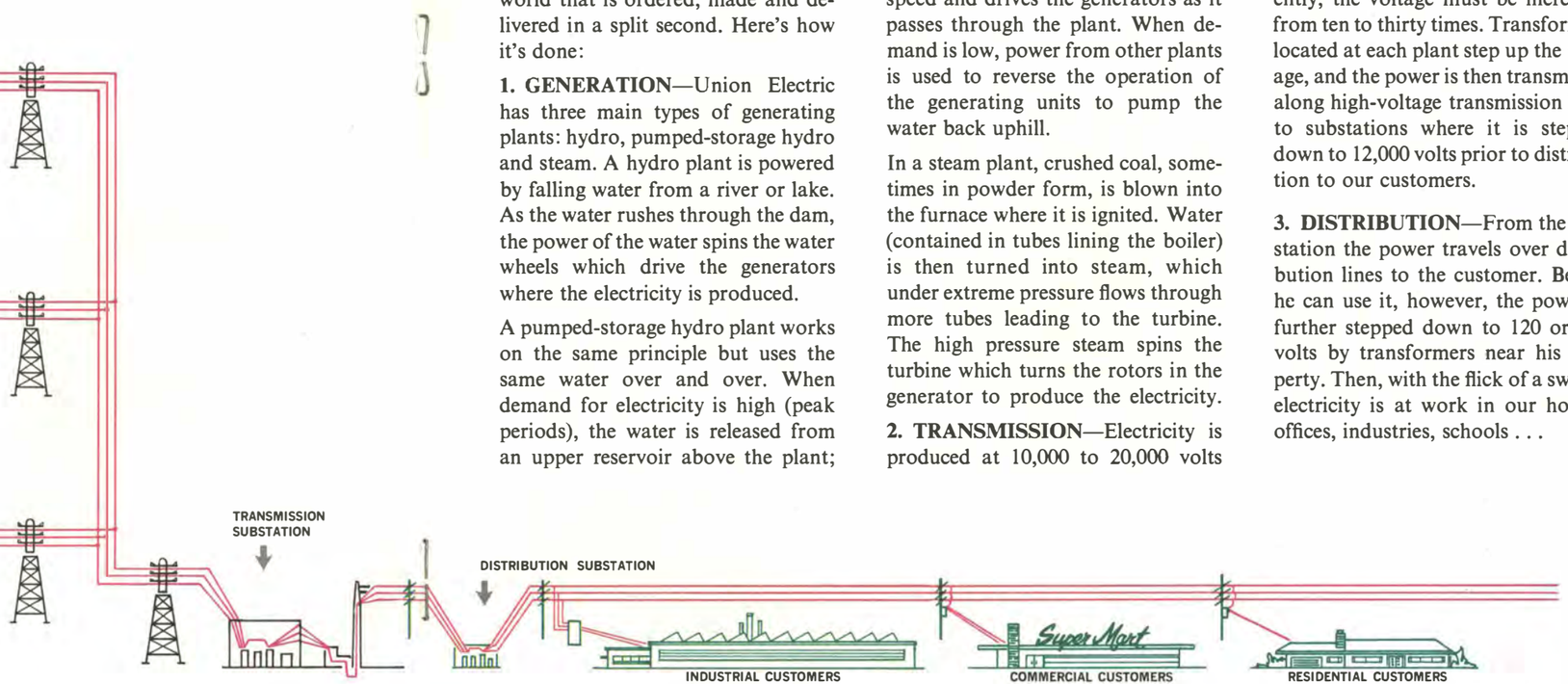


● PUMPED-STORAGE PLANT



● CONVENTIONAL HYDROELECTRIC PLANT





GENERATION — TRANSMISSION — DISTRIBUTION

Electricity is the only product in the world that is ordered, made and delivered in a split second. Here's how it's done:

1. GENERATION—Union Electric has three main types of generating plants: hydro, pumped-storage hydro and steam. A hydro plant is powered by falling water from a river or lake. As the water rushes through the dam, the power of the water spins the water wheels which drive the generators where the electricity is produced.

A pumped-storage hydro plant works on the same principle but uses the same water over and over. When demand for electricity is high (peak periods), the water is released from an upper reservoir above the plant; it flows through a tunnel at great speed and drives the generators as it passes through the plant. When demand is low, power from other plants is used to reverse the operation of the generating units to pump the water back uphill.

In a steam plant, crushed coal, sometimes in powder form, is blown into the furnace where it is ignited. Water (contained in tubes lining the boiler) is then turned into steam, which under extreme pressure flows through more tubes leading to the turbine. The high pressure steam spins the turbine which turns the rotors in the generator to produce the electricity.

2. TRANSMISSION—Electricity is produced at 10,000 to 20,000 volts but to be sent long distances efficiently, the voltage must be increased from ten to thirty times. Transformers located at each plant step up the voltage, and the power is then transmitted along high-voltage transmission lines to substations where it is stepped down to 12,000 volts prior to distribution to our customers.

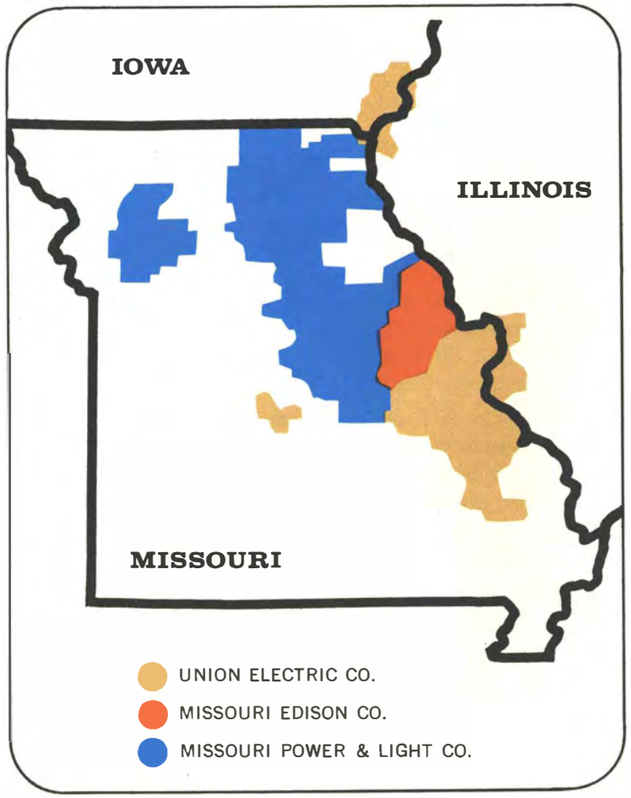
3. DISTRIBUTION—From the substation the power travels over distribution lines to the customer. Before he can use it, however, the power is further stepped down to 120 or 240 volts by transformers near his property. Then, with the flick of a switch, electricity is at work in our homes, offices, industries, schools . . .

THE UNION ELECTRIC SYSTEM

The Union Electric System includes Union Electric Company and its two subsidiaries, Missouri Power and Light Company and Missouri Edison Company. In total, this investor-owned power system provides electricity to over 2½ million people in a 19,000-square-mile service area which includes parts of Missouri, Illinois and Iowa.

SYSTEM STATISTICS

- Annual Revenue—Over $270 million
- Annual kwhr Sales—16.7 billion kwhr
- Total Investment—Over $1.5 billion
- New Investments—Averaging $150 million annually
- Number of Stockholders—94,000
- Number of Electric Customers—800,000
- Number of Employees—6,000
- Investment per Customer—$1,900
- Investment per Employee—$255,000
- Average Residential Customer Usage—6,560 kwhr annually



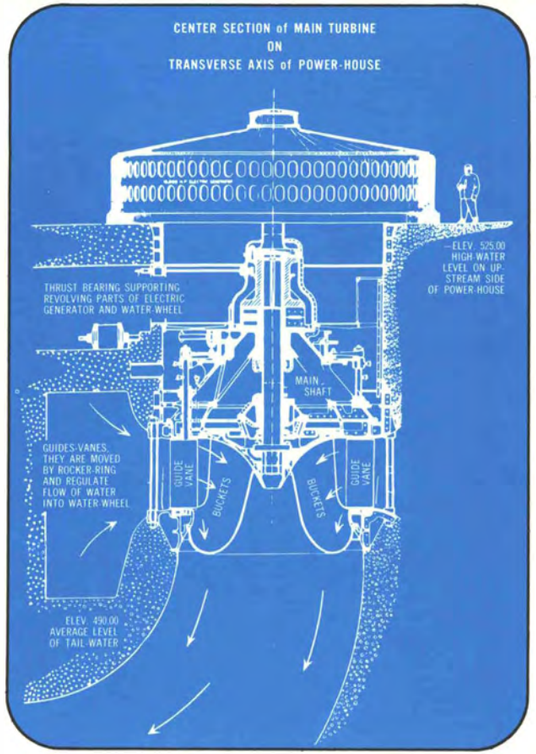
KEOKUK PLANT OPERATION

(continued from page 1)

Originally, plans called for the installation of 30 main units and four smaller house service units, but only half of these were installed, since later studies indicated that water to drive the extra units would be available for only a few months of the year. Nine of the main units produce at 11,000 volts for distribution directly to industry in the Keokuk area and, after being stepped up to 110,000 volts, for transmission to St. Louis. The six units at the north end of the plant produce current at 13,800 volts for local distribution or for transmission at 69,000 volts to local substations.

Since this is a run-of-the-river plant, it must pass down the river whatever amount of water flows into the pool above the dam but does not interfere with the river flow. This is controlled by operating the number of hydroelectric generators necessary to utilize the entire river flow and, if there is more flow than the turbines can use, by opening gates on the dam to pass the surplus water.

Water enters the plant from the forebay on the west side and continues into each unit's spiral-shaped concrete compartment (the scroll chamber). A turbine runner (or water wheel) is located at the center of each spiral. The spiral shape of this chamber directs the water so that it pushes with uniform force on all of the vanes of the wheel. This force rotates the shaft which, in turn, drives the generator to produce electricity. After pushing on the water wheel the water is discharged downward into a passageway that delivers the water into the tailrace. When operating at full capacity, the plant contributes 135,000 kilowatts of power to the Union Electric system.



Statistics on Keokuk Dam and Power Plant

1,287,000 cubic yards of earth and rock excavated.
3,000,000 man-days work to build dam and plant.
565,000 cubic yards of concrete.
50 square miles of lake area.
60,000,000,000 gallons of water in the lake.
135,000 kilowatts peak capacity.
10,000 horsepower turbines—15 of them
2,000 horsepower auxiliary or house turbines—2 of them
57.7 revolutions per minute for 25 cycle
62 revolutions per minute for 60 cycle
800,000,000 kilowatt-hours annual output.
119 spillway gates.
Upper pool elevation—525 feet Memphis Datum
Lower pool elevation averages 491 feet Memphis Datum
Difference, or head, 34 foot average.

4,000 persons employed in local industries. Local industrial development largely due to existence of adequate, low-priced electric energy.

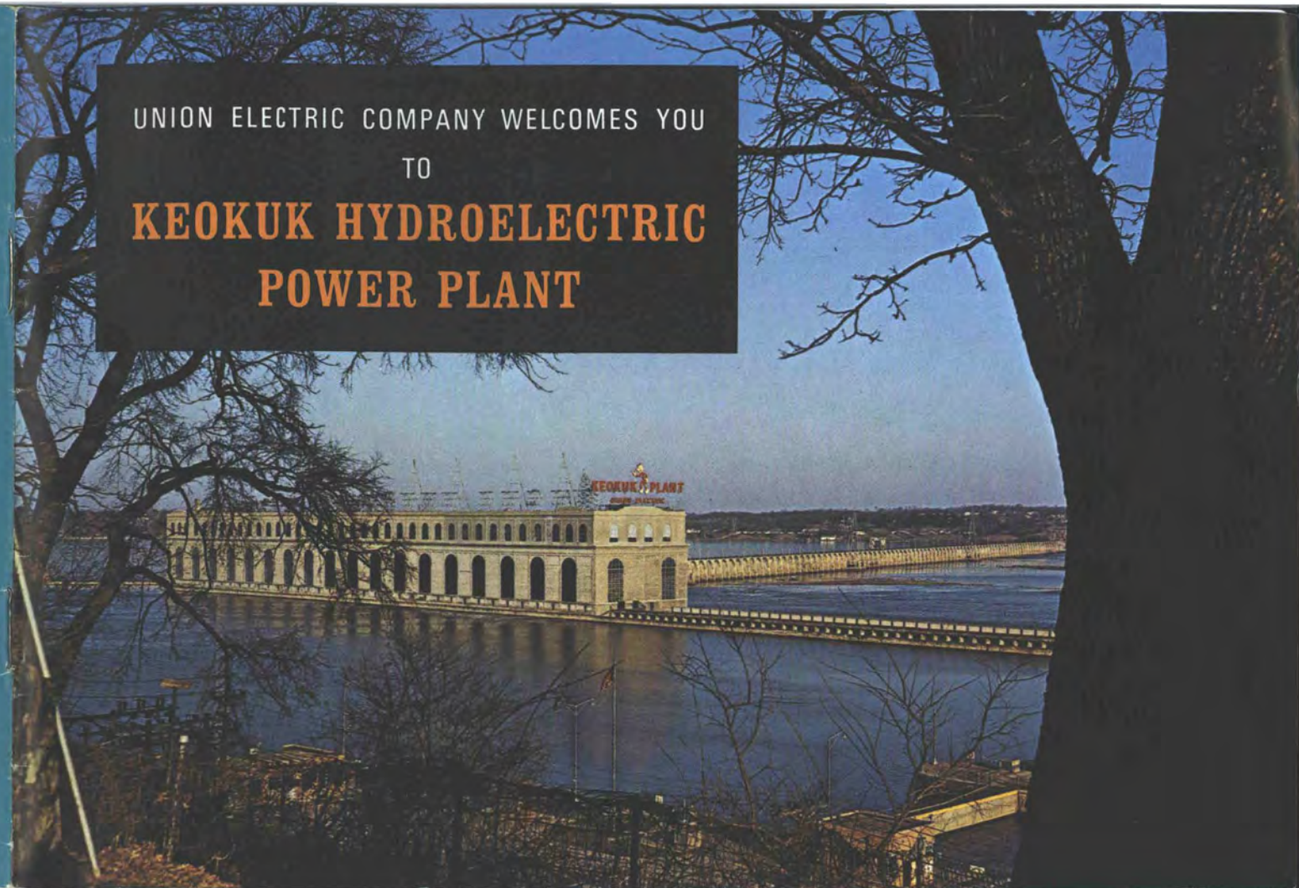
INVESTOR OWNED

UNION Electric COMPANY

UNION ELECTRIC COMPANY WELCOMES YOU

TO

KEOKUK HYDROELECTRIC POWER PLANT



We are happy to welcome you to

KEOKUK PLANT

. . . one of the ten power plants in the Union Electric system. Keokuk Plant is one of the three Union Electric plants that generate electricity from water power for use in your home, on your farm, and in your factories.

This is an investor-owned power plant which since it was built has paid taxes equivalent to its entire cost of construction. It could even be called customer-owned because many of the customers are also investors in its securities. Many others of us are indirectly owners through life insurance companies, mutual funds, or other organizations that purchase Union Electric securities.

DESCRIPTION OF THE PLANT

This is a hydroelectric plant which utilizes the force of the water to turn electric generators. The plant is 900 feet long and stands the equivalent of 10 stories above the upper water level. The foundation or substructure is of monolithic concrete without reinforcing and without expansion joints. This structure includes the water passages which guide the water into the wheels where it does the work.

The original design contemplated the installation of 30 main units and four smaller house service units but only the first half of these were installed. Up-to-date studies indicate that additional units would not be economical since water to drive them would be available for only a few months of the year. The structure over which you entered the plant was erected for these additional units but will probably never be used.

The dam itself is seven-eighths of a mile long. It is keyed into the hard rock of the river bottom and rises 53 feet from its base. There are 119 gates and spillways on the dam for discharging excess water when the flow is greater than the turbines can utilize. These spillways gates are lifted by either of the two traveling cranes on the dam and are held in position by the hinged props near the top of the gate slots.

The water wheels are Francis turbines rated 10,000 horsepower each at 32-foot head. That is, when the difference in water level of the upper level and lower level is 32 feet, each turbine is rated to produce 10,000 horsepower. The generators originally rotated at 58 revolutions per minute to supply 25 cycle electric service. Six of the generators have been rewound and now rotate at 62 rpm to produce 60 cycle service. The water wheels are 16 feet in diameter and are connected to the generator by a shaft 25 inches in diameter. The entire rotating weight is carried on a six-segment Kingsbury thrust bearing, which sustains a total load of 550,000 pounds.

Electricity is produced at 25 cycles, 11,000 volts in nine generators for distribution to heavy industry in the Keokuk area. It is also put through transformers which increase the voltage to 110,000 volts for transmission over the line to St. Louis. The six units at the north end of the plant produce 60 cycle current at 13,800 volts for local distribution or for transmission at 69,000 volts to Hamilton and Viele substations. Electricity from these substations feeds other utilities at 69,000 volts or is sent through step-up transformers to St. Louis at 138,000 or 161,000 volts.

Much of the original switchgear, installed in 1912-'13, has proven inadequate for the high power duty imposed by connections made to the plant in recent years. During the past twenty years about two-thirds of the gear has been replaced.

Energy leaves the plant on lines suspended from roof towers and also on underground cables which go across the dam to Illinois or under the lock to the Iowa shore.

The District Dispatcher in the plant control room has gages indicating the level of the water, both above and below the dam, and also at Fort Madison bridge 25 miles above the dam. He has telephone connection to all parts of the plant, substations in the area, St. Louis, and neighboring utilities, and has a short wave radio for communication to line crews and troublemen working in the area.

The plant is operated 24 hours a day, seven days a week, by a crew which, at the present time, consists of eight men per shift. Five of these are directly concerned with the operation of the water turbine machinery and the other three handle the electrical controls from the control room on the top floor of the plant. Filling these eight jobs on a full schedule with vacations and sick relief included takes about 35 men. The balance of the plant force, some 56 people, are assigned to maintenance, construction, storekeeping, and office work.

Shipments to the plant are made to Keokuk store rooms and shuttled to the plant by company vehicles or to Hamilton, Illinois, and brought across the dam by the electric locomotive car.

Lake Keokuk Creates a world of Fun and Beauty

Lake Keokuk offers many idyllic prospects of blue sky and water.

Pleasure craft moored at one of many marinas dotting the shore.

Flowers form a blaze of beauty in famous Rand Park, Keokuk, Iowa.

Water sports of every type are popular.

Photographs courtesy Keokuk Camera Club.

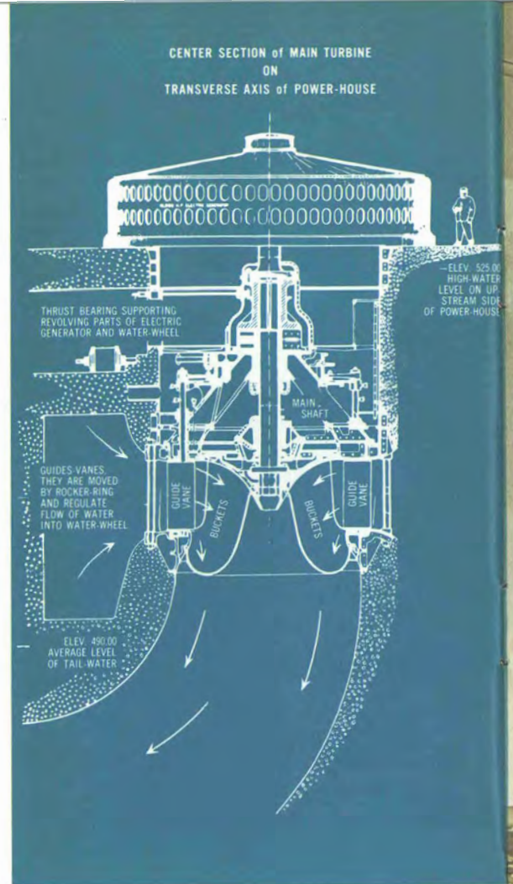
Crisp autumn brings bright colors to the trees along the Mississippi bluffs.

An old river boat has been transformed into a museum.

Keokuk Plant Operation

This is a run-of-the-river plant. It must pass down the river whatever amount of water flows into the pool above the dam but does not interfere with river flow. This is controlled by operating the number of hydroelectric generators necessary to utilize the entire river flow and, if there is more flow than the turbines can use, by opening gates on the dam to pass the surplus water. Therefore the water you see going through the spillways on the dam represents water not being used for the generation of electricity. Water enters the plant from the forebay on the west side and flows through racks designed to hold back driftwood and trash. It continues into the spiral-shaped concrete compartment called the scroll chamber. The turbine runner (or water wheel) is located at the center of this spiral. The spiral shape of this chamber directs the water so that it pushes with uniform force on all of the vanes of the wheel. This force rotates the shaft which, in turn, drives the generator to produce electricity. After pushing on the water wheel the water is discharged downward into a passageway that delivers the water into the tailrace.

The turbines have automatic governors which hold them at nearly constant speed. To do this the governor works through an oil pressure system to open or close the guide vanes around the wheel. The governor opens the vanes to increase speed or pick up more load and closes the vanes to decrease speed or reduce load. The setting of this automatic governor is under control of the operator in the control room who can change the setting so that the automatic governor will hold the load at any desired amount. Actually, the load on an electrical system is controlled by the customers. The power plants of the Union Electric System are integrated and controlled from a central Load Dispatch Room so that enough electricity is generated most economically to exactly match the customers' demands.



Centralized Control

The Load Dispatching Office in St. Louis is the master control center of the Union Electric System. Here, through the use of new electronic computers, the generation of electricity from all the power plants is controlled and dispatched over the vast network of transmission and distribution lines to serve the constant needs of our customers at the lowest possible cost.

MERAMEC POWER PLANT

MOUND POWER PLANT

VENICE POWER PLANT

OSAGE POWER PLANT

ASHLEY POWER PLANT

KEOKUK POWER PLANT

CAHOKIA POWER PLANT

TAUM SAUK POWER PLANT

LABADIE POWER PLANT

SIOUX POWER PLANT

History of the Dam and Power Plant

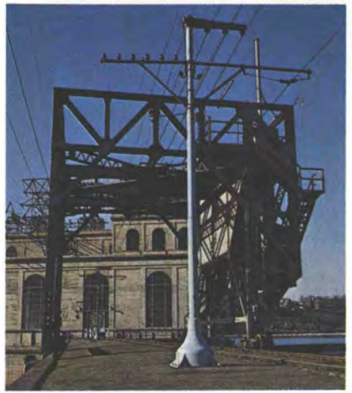
In the early days of this country when roads, bridges, and railroads were not developed, travel was by canoe, raft, and boat on the rivers and lakes because forests, mountains, and rivers hampered passage of horses, wagons, or pedestrians. The mighty Mississippi (Father of Waters) was then a major traffic artery that had one spot difficult or impossible to pass, the Des Moines rapids, which extended 15 miles up the Mississippi from the mouth of the Des Moines River. Cargoes were therefore unloaded at this point and transported overland past the rapids and there reloaded on boats to continue. A town grew up at the unloading point and was named Keokuk —the "Gate City."

The enterprising people of the community saw the force of the river rushing over the rapids and, as early as 1848, organized a company to build a water power plant here. (In those days water power drove grain mills or textile machinery rather than electric generators.) In 1868 the U. S. Corps of Engineers started building a canal around the rapids. In 1899 Mr. C. P. Birge organized the Keokuk and Hamilton Water Power Company to harness the force of the river and to promote the development of the region. In 1901 this company secured from Congress a franchise to build a wing dam to produce a little power, but two years later this plan was abandoned in favor of a bolder plan—a complete dam. This project was explained and sold to navigation interests and municipalities, and finally in 1905 Congress granted a franchise to build the dam and power plant provided the builders would also construct a lock and drydock and turn these over to the U. S. Engineer Corps.

The company immediately received many propositions from would-be promotors and constructors but, in the words of one of the founders, "All of these were short of money or brains, or both." Late in 1905 the company secured the attention of Hugh L. Cooper, who had engineered the installation of a plant at Niagara Falls. Through him a syndicate established in Toronto secured an option on the rights of the existing company. He proceeded with engineering surveys but in two years the option was allowed to expire. A similar option was then granted Mr. Cooper personally and, by dint of a great deal of work, he succeeded in arranging to sell the energy to the power company and street railway company in St. Louis. Then for two years he sought without success to get financing for this daring project of building the largest power plant and dam in the world and building the longest and highest voltage line to carry the energy to St. Louis. After many disappointments, early in 1910, he secured a commitment from Stone & Webster to finance the project. Just 30 days before the franchise expired, work was actually started by a small crew with pick and shovel on the Illinois shore. The heavy work started later that year and was pushed through to completion in 1913. This project represents a triumph of free enterprise, for the developers secured for the welfare of the area the cheap electrical energy available from nature—constantly renewed and everlasting—and at the same time improved navigation and stabilized river conditions. This cheap electricity brought industries into the area so that now substantially all of the output of this plant is sold locally to the industry that it sired. Where there was a hazard and impediment to navigation, there is now a productive installation which raises the standard of living of people in the area.

The skill and competence of the constructors is shown by the fact that all of the turbines are still in use at full capacity. The need for 60 cycle current has required the conversion of six of the generators from the original 25 cycle to the more modern 60 cycle, but this was accomplished by change of electrical winding only.

In 1925 Union Electric Company of St. Louis acquired the dam, power plant, and transmission lines, and it is now integrated as a part of the Union Electric system, which extends from Burlington, Iowa, through St. Louis to the Lake of the Ozarks in Missouri.



MEET THE ROCK ISLAND DISTRICT U. S. ARMY CORPS OF ENGINEERS

ENGINEERING CONSTRUCTION OPERATIONS RECREATION FLOOD CONTROL NAVIGATION
ROCK ISLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS

Quad-Cities Generating Station
Route 84
Cordova, Illinois 61242