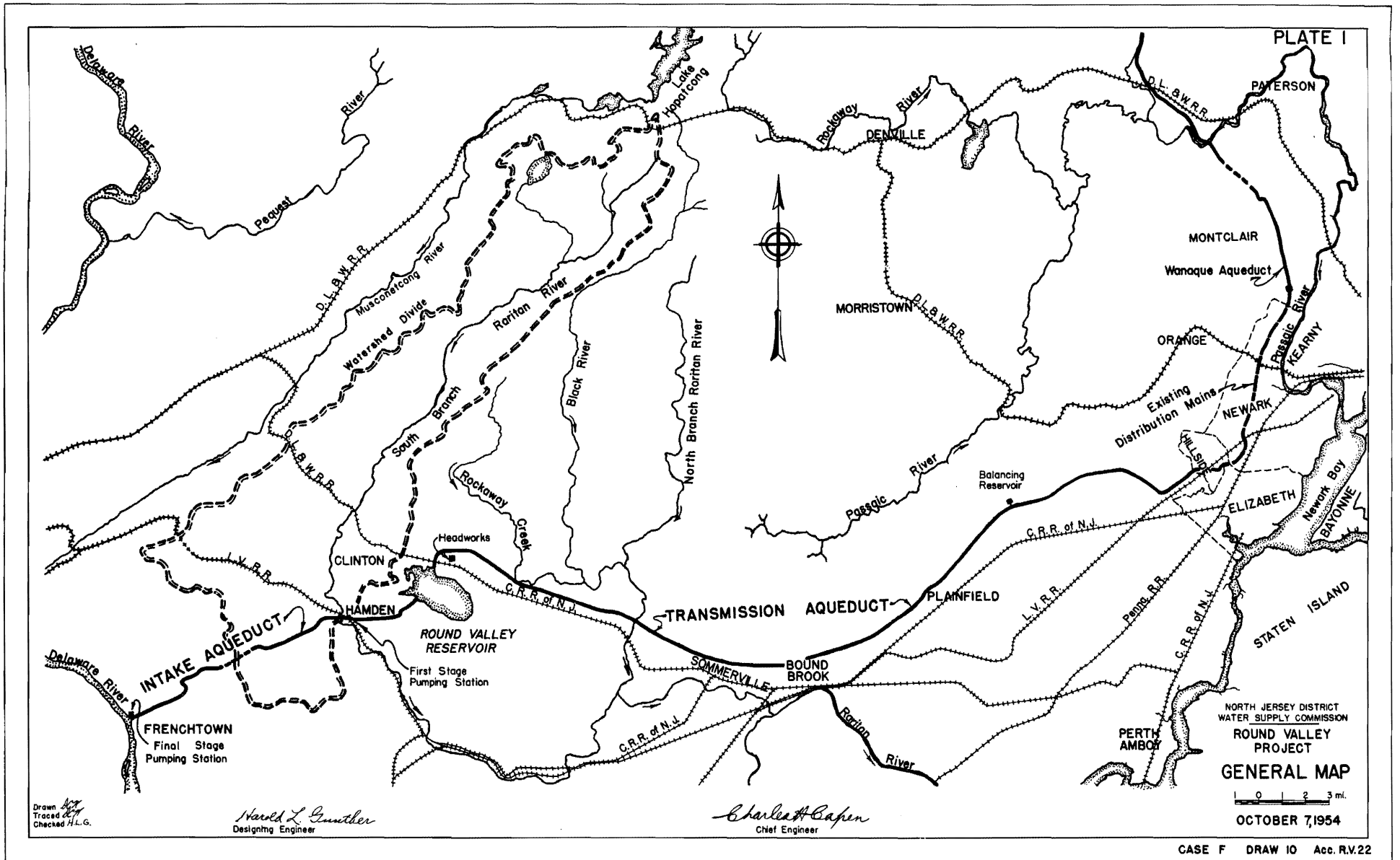


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THE ROUND VALLEY PROJECT

For the

METROPOLITAN SECTION OF THE
NORTH JERSEY WATER SUPPLY DISTRICT

Prepared for the Municipalities of

ELIZABETH

HILLSIDE

NEWARK

by the

N.J. Water Supply Commission.
NORTH JERSEY DISTRICT, WATER SUPPLY COMMISSION

November 1, 1954.

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INTRODUCTION

In accordance with the resolutions of the cities of Elizabeth and Newark and the Township of Hillside, and following conferences with representatives of these municipalities, the North Jersey District Water Supply Commission has studied the subject of an additional water supply. These studies have been completed and the resulting findings are given in the following summary, which outlines in brief form the conclusions reached.

I

SUMMARY

1. Water needs of the northeastern metropolitan area of New Jersey are increasing and a new large water supply is urgently required to meet these growing demands.
2. Inspections of the various areas proposed for a reservoir site in the past, to serve the area requesting this report, have brought the conviction that only Round Valley remains reasonably obtainable.
3. Water to fill Round Valley can be most economically diverted into the reservoir by establishing a pumping station at Hamden on the South Branch of the Raritan River.

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4. The watershed area of the South Branch at Hamden is 140 square miles.

5. An initial yield of 50 million gallons per day (m.g.d.) or 70 m.g.d., can be economically developed by building the dams for a flow line elevation of 350 and 380 respectively.

6. By pumping at the maximum rate of 200 m.g.d. from the river during favorable times, a yield of 70 m.g.d. is possible with the storage provided, and at the same time it will be possible to permit a reasonable flow to go downstream.

7. To develop the system beyond 70 m.g.d., it will be necessary to establish another pumping station on the Delaware River just above Frenchtown.

8. For a development of 200 m.g.d., a flow line elevation of 380 and a storage of 50 billion gallons will be required.

9. Delivery would be at Elevation 235 at the south terminus of the Newark-Elizabeth 60-inch pipe line, or at such slightly higher elevation as may be required to send water into the South Orange Avenue reservoir in Newark. Flow will be principally by gravity.

10. Cost of construction and development for 50 m.g.d. is estimated at \$47,803,250, exclusive of interest during construction.

11. Cost of construction and development for 70 m.g.d. is estimated at \$54,345,165, exclusive of interest during construction.

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12. The development of an additional 130 m.g.d. can similarly be accomplished in stages. Since the construction of the additional part of the system from this source may not be initiated for at least 10 years, no detailed estimate has been made for it. The rough estimate for this development at this time would indicate an approximate cost of \$26,000,000. The cost per m.g.d. developed will be materially reduced as the volume of water diverted from the Delaware River increases. This stage does not require a new reservoir site, nor duplication of rights-of-way.

II

HISTORICAL

No one connected with the water supply situation in northeastern New Jersey can help being aware of the many occasions on which various sources of supply have been advocated and reported upon. The North Jersey District Water Supply Commission has, both by legal requirements and custom, taken a leading part in helping to bring a solution to some of these problems by presenting viewpoints gathered in the course of nearly 40 years of experience.

In the past there have been studies made of such projects as Stony Brook, Long Hill, Chimney Rock, Bunnvale, Dock Watch Hollow, Round Valley, and, on an interstate basis, the plan promoted by the Interstate Commission on the Delaware River Basin (Incodel). All of those listed in New Jersey, with the exception of Round Valley, have in effect been elim-

-4-

inated largely by the growth of population in the areas. The Incodel plan became improbable of accomplishment when Pennsylvania failed to approve the interstate proposal and New York City subsequently made separate plans which preclude economical joint action.

There are very few left who cannot be convinced that the other sites mentioned are not usable because of the growth in those areas. On the other hand, Round Valley has not been subject to the type of growth prevalent in the other locations. There have been a very few new homes built in the Valley in the last two or three years. This is indicative of what may happen to eliminate this one last natural valley from consideration.

It may be noted that the foregoing comments do not apply to such projects as the Longwood Valley Reservoir proposed by Jersey City, the Point View Reservoir proposed by the Passaic Valley Water Commission, and the West Livingston Reservoir now being advanced by the Commonwealth Water Company. All of these have a justifiable engineering background and may well furnish some portion of the additional water that will be required or is already needed.

Presently about fifty residences exist in the Valley, mostly connected with farms. To utilize the area for reservoir purposes will require purchasing about 3,500 acres of land, of which about 2,200 acres will eventually be covered with water.

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The present studies were initiated by the cities of Elizabeth and Newark and the Township of Hillside. These three municipalities, by resolution, authorized this study to be made by the North Jersey District Water Supply Commission. The vision and courage of the municipalities are noteworthy and commendable, and will unquestionably expedite the ultimate solution of this pressing problem. In the past, every municipality that joined in the Wanaque and Ramapo Projects (completed in 1930 and 1953 respectively by the Commission) has felt amply repaid for its foresight.

By no means does this action and study limit the ultimate use of Round Valley water to those three municipalities. The design and capacity will accommodate many others. It is also expected that arrangements will be made so that private water companies and industries may take water from this source when they desire to do so. The complete Round Valley system will meet the needs of northeastern New Jersey for most of the balance of the Century.

III

ROUND VALLEY PROJECT - FIRST STAGE

General Features

It is well to understand that the principal components of a large water supply of this nature consist of (1) intercepting the flow of one or more streams from a suitable catchment area; (2) storing the water in an impounding reservoir; and (3) transporting the water through a large conduit

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or transmission line to the potential consumers. In the present instance these would be accomplished as follows:

(1) The flows of the South Branch of the Raritan River, exclusive of extreme flood flows and normally required minimum flows, would be intercepted at Hamden at which point pumps would be installed to send the water through a large force main to Round Valley.

(2) The valley would be formed into an impounding reservoir by means of suitable dams.

(3) A treatment plant would be located on the north side of the reservoir from which a transmission main would transport the water to the terminal point at the Newark-Elizabeth line, with required take-off points en route.

Inlet Works

The existing low dam at Hamden, originally constructed for the operation of a flour mill and a grist mill by water power, diverts water into the raceway formerly used by the mill. It will not be necessary to reconstruct the dam but the raceway would be enlarged and enclosed in a pressure pipe to the pumping station. Pumps would consist of four units, each capable of delivering 50 million gallons daily against a static head of about 200 feet. The motors necessary to operate these pumps would have a total capacity of 9,000 horsepower (H.P.).

Force Main

A force main consisting of twin pipes, each of 6 feet diameter, would traverse a distance of 3.3 miles between

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Hamden and the southwesterly corner of the reservoir. Other points of diversion were considered but this was found most economical.

Reservoir

Round Valley is well described by its name. It is located in Clinton Township, Hunterdon County, and is slightly oval in shape with the general floor of the valley being 2.6 miles long by 1.5 miles wide. Enclosing most of the valley is Cushetunk Mountain, composed entirely of diabase, (trap rock). This rock formation forms an ideal enclosure, and, at the points where it is required that foundations for dams be established, the stability and density of the rock is excellent.

The floor of the reservoir is derived from a red sandstone formation but no important structures rest thereon and no special engineering problems arise because of this condition.

Two small streams originate in the valley. The larger is Prescott Brook which flows out the southwest corner of the valley to empty into the South Branch of the Raritan River below Stanton. The smaller stream flows out of the northern side of the valley and is a tributary of the South Branch of Rockaway Creek which in turn flows into the North Branch of the Raritan River.

In order to form a reservoir it is necessary to place a dam across each of the streams. The one across Pres-

-8-

cott Brook has been termed the South Dam. The force main from Hamden is planned to enter the reservoir at this point. Provisions are included to permit a let-down of water to maintain a constant flow in Prescott Brook.

At the northerly pass from the valley the North Dam would be constructed across the small stream at that location. The outlet works would be situated to the northeast of this structure.

In addition to the dams mentioned, it will be necessary to prevent escape of water from the northwest corner of the reservoir area by construction of a dike across the low saddle at that point.

It is contemplated that sufficient lands will be obtained to control the quality of any waters flowing directly into the reservoir. As a further means of improving the quality of the water, it is planned to clear all vegetation within the reservoir flow line and to remove stumps and roots.

The arrangement of inflow and outflow assures a maximum storage time across the deep end of the reservoir, thus giving the utmost advantages for improvement of water quality and temperature that are imparted by prolonged storage and depth.

Dams

The South Dam and the North Dam would cross the road between Lebanon and McPherson. The South Dam would be across Prescott Brook at McPherson, while the North Dam would be across

-9-

the tributary of Rockaway Creek a short distance south of the Central Railroad of New Jersey. The dike (or Northwest Dam) would be located across the saddle that exists approximately fifteen hundred feet west of the location of the North Dam.

Engineering studies have established the desirability of designing the dams as earth fill structures with concrete core-walls. Typical cross-sections of these dams are shown on Plates II, III and IV in the Report.

Geology

Because of the many interesting features of the geologic formation at Round Valley, a special effort has been made to explore the underground conditions at the locations of the two dams and the dike.

From the start the explorations have been pursued in close cooperation with State Geologist Meredith E. Johnson and his staff. A contract was awarded to Sprague and Henwood, Inc., for making a series of core borings along the center-line of the proposed three structures.

There is a geologic fault line that traverses up the Prescott Brook and crosses the valley to the northwest through the dike site. The location of the fault and the respective rocks forming it have been found and plotted, as a result of which it is reasonable to state that with a concrete core-wall and suitable grouting, excellent dams may be constructed.

Surveys

In order to establish a basis for computation of quantities of materials required for dams, field surveys were made at the locations of the proposed structures. These were accomplished by Studer and McEldowney, Civil Engineers and Surveyors of Clinton, New Jersey. The resulting topography is shown on the respective maps of the two dams and the dike, Plates II, III and IV.

Outlet Works

At the North Dam a gate house would be constructed which would control the flow of water out of the reservoir to the ultimate consumers and would permit a regulated flow to go down the stream presently emerging at that point.

Near this same location the main headworks will consist of a combined chemical treatment building and filter plant, an administration building, and a general utility building that will house a garage, carpenter shop, paint shop and storehouse. In addition there would be a standby or booster pumping station which would maintain pressures on the transmission main when the elevation of the water surface in the reservoir is too low to insure the desired pressure.

Transmission Main

The initial transmission main, for either a 50 m.g.d. or 70 m.g.d. development, will be a 72-inch pipe traversing a route somewhat parallel to State Highway No. 22. It is planned

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that a number of take-offs will be provided, some to be used as soon as those who desire to do so connect to the system and others to be located at intervals for future possible connections.

This pipe will be a pressure line throughout its entire length, a distance of 38 miles. In the first stage, water will be available at a maximum elevation of almost 350 at the reservoir, reducing to about 235 at the Newark-Elizabeth boundary line. This is ample head for any users throughout the area to be served with the possible exception of a few communities in Hunterdon County which may require a small booster station to make available sufficient head for their present and future needs.

Balancing Reservoir

Because of the fact that peak demands for water are sometimes as much as 75% more than the annual average, a balancing reservoir will be built to "float" on the line near the areas to be served. This will hold the size of most of the aqueduct to that made necessary by the amount of the average daily draft. The balancing reservoir would be a covered reinforced concrete structure containing 20 million gallons, sufficient water to meet peak demands. An available site has been tentatively selected.

Utilities

The New Jersey Power and Light Company has a 33,000-volt transmission line traversing the northwesterly portion of the valley and leading from Lebanon toward Flemington. This, together with a multi-pair cable telephone line, will have to be relocated outside the reservoir area. The cost of such removal is not great and is included in the estimates.

Highways

Traffic on the road leading from Lebanon south and traversing the westerly side of the valley toward McPherson would be diverted outside the reservoir area. The same would be true of traffic on the east-west road that traverses the middle of the valley. Similar instances in the past have resulted in better roads than those originally existing. The cost of these new roads is also included in the estimates.

Quality of Water

Because of the long storage provided, namely a minimum of 250 days in the final stage and considerably more than that at first, the water will be of such high quality that it could be delivered to consumers with very little treatment. With the knowledge, however, that the public is

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becoming increasingly conscious of water quality, the extra safeguard of filtration has been considered advisable. This will be done by pressure filters without the necessity of coagulation basins because the long storage makes further settling unnecessary.

The great depth of the water in the reservoir, even in the first stage, averaging fifty feet or more (and eighty feet in the second stage), is such that water of a desirable low temperature can be delivered.

All of these features make it possible to predict that the water to be obtained from this source will be equal in quality to the best of the large sources now available in this part of the State.

Real Estate

It is quite natural that those residing in the Round Valley area have a deep interest in trying to learn the outcome of the proposal to acquire their properties for this purpose. In fairness to them it is highly desirable that a decision be made as soon as practicable.

While no one can definitely apply a general term to the attitude of the valley residents, it seems, from investigations made thus far, that the owners will be willing to accept the greater needs of public water supply as

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inevitable, provided that they can be assured of obtaining fair prices. In general they appear to be aware that purchases for the Wanaque and Ramapo projects, as examples of past developments, have been equitable. Little opposition has therefore come from the owners.

IV

STAGES

First Diversion

It is practicable to develop the Round Valley project for 50 m.g.d. or 70 m.g.d. This can be done either by developing only 50 m.g.d. at present, and expanding to the larger amount later, or it can all be done initially. Decision as to which course to pursue will depend on the amount of water which the potential consumers indicate that they will need and for which they will contract.

Final Stage

The final stage entails diverting water from New Jersey's share of the Delaware River. Studies have shown that this may be admirably combined with the Hamden diversion point by constructing a pumping station just north of Frenchtown. An intake would carry water from the Delaware River to the pumping station in which either four or six units, having a total capacity of 200 m.g.d., would take water during the periods when such diversion would not adversely affect the flow to downstream riparian owners. The motors for these

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pumps would have a total rating of 14,000 horsepower.

By pumping at a rate of about 200 m.g.d. over a period of 250 days or less, the ultimate yield of the system can be increased to a total of 200 m.g.d., i.e., the 130 m.g.d. yield from this source will supplement the 70 m.g.d. yield from the South Branch.

When demand for this water is evident, capital costs will be less per m.g.d. than for any development on the South Branch alone. Thus, as in many other endeavors, water supply benefits by lower production costs when the quantity of output is increased.

It may also be noted that it is not essential to develop the entire 130 m.g.d. from the Delaware River at once. By using step development, the same economy of quantity production will be available and the ultimate production costs will be about half of the initial cost of a 50 m.g.d. project.

Force Main

To carry the water from the Delaware River to Round Valley, it will be necessary to install a large size pipe line or two smaller ones. In order not to increase the head by taking the water over the highest point of the route, part of the force main will be in tunnel section. There is approximately 12 miles of open cut and 2.2 miles of tunnel.

Transmission Line

It will be necessary at some time in the future to

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install some additional transmission facilities, to those areas where water is needed.

Appurtenances

The filter plant and possibly the balancing reservoir will have to be increased in size later to take care of the increased amount of water to be handled.

Estimates of Cost

Estimates of cost for the 50 and the 70 m.g.d. alternates, for diversion of water from the South Branch of the Raritan River, are contained in Tables I and II annexed.

V

NEED FOR WATER

No one connected with daily water supply problems in this area can help being impressed with the increasing demands for water and the almost annual occurrence of shortages in one section or another. True, the cause is not always a lack of supply, but there are so many signs pointing the way to an ultimate severe shortage that the warning cannot be neglected.

During the period between 1940 and the present the daily demand in the northeastern part of New Jersey has increased more than fifty per cent, or at the rate of 11 m.g.d. per year. The means being taken to meet this increase are by no stretch of the imagination considered adequate.

Experience has shown that the results obtained from

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efforts to curtail the use of water are temporary. They continue for some time after a water shortage, but within a year or less, consumption resumes its former pace.

As an example of increases in usage the modern housewife, in seeking a new home, requests all the new water-consuming gadgets that make housework less burdensome. The male side of the family wants an air-conditioned office (a large source of water usage) so as to work more efficiently. And last, but by no means least, who will say "No" to the many new industries that wish to locate in New Jersey or to existing ones that wish to expand?

There is no indication that water consumption will diminish or even level off eventually. Quite to the contrary, it is evident that the use of water is expanding. Those whose duty it is to try to foresee these increased needs would be remiss in their duty indeed if they failed to bring their findings before those who may be in a position to translate these requirements into positive action.

A projected estimate of population for the six counties of Bergen, Essex, Hudson, Middlesex, Passaic and Union, the principal counties of the North Jersey Water Supply District, was made by the Research and Statistics Section of the New Jersey Department of Conservation and Economic Development. This projection indicates an increase of 13.2% between 1950 and 1960. For the entire State there is a projected increase of 20.2%.

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If only 50% of the anticipated demand in northeastern New Jersey occurs, it will require an additional supply of 55 m.g.d. in the next 10 years. The minimum first stage of the project, calculated to produce 50 m.g.d., would therefore furnish only the minimum margin of safety for future water supply in the District, with the opportunity for further expansion, if the demand should be greater than 50%.

VI

VALIDITY OF THE PLAN

There is no need to dwell on the merits of Round Valley or to compare it in general with other plans. There is no other project suitable or available that can produce the amount and quality of water that can be had from Round Valley at anything like the cost and with so little disruption of existing establishments.

For once, perhaps the first time in more than 30 years, engineers are pretty well agreed on the general features and desirability of this plan. The mere fact that a few people are outspoken in their opposition to this project has little weight insofar as the merits are concerned.

It is important to note that no new additional legislation is required if the present applicants and additional municipalities decide to finance the project. Neither is there any prohibition on the taking of waters from any of the tributaries of the Delaware River if the plan should ever be revised.

The first stages represent a taking from the South Branch of the Raritan River and only the ultimate stages contemplate taking from the Delaware River.

The course is clear, the plan is valid. All that is needed is the concerted action of interested parties to start the necessary wheels in motion.

VII

FINANCIAL ASPECTS

The Incodel proposals and engineering reports indicate that the first stage of their development would provide 240 m.g.d. for New York and 225 m.g.d. for northern New Jersey, or a total of 465 m.g.d. The cost of that project, estimated in 1950, was \$516,932,100. It would therefore appear that New Jersey's share of the Incodel Project would have been approximately \$250,000,000 for a supply of 225 m.g.d. Comparing this with the total estimated cost of the complete Round Valley Project for the ultimate production of 200 m.g.d., indicates that the Incodel estimates of cost represent approximately three times the estimated cost of the Round Valley Project for almost the same quantity of water.

The sponsors of this Report have made application for the following quantities of water:

Elizabeth	15 m.g.d.
Newark	5 to 15 m.g.d.
Hillside	2½ m.g.d.

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Recently the City of Bayonne has indicated that it would like to obtain a permanent supply of water and that it may be interested in joining in a formal application for the Round Valley Project.

In order to provide sufficient capital investment for the initial stage of the Round Valley Project, it will be necessary to secure the cooperation of other municipalities until 50 m.g.d. has been subscribed. It is the considered opinion of the Commission that because of the anticipated increased demand, heretofore reviewed, applications from additional users will be forthcoming to subscribe to the balance of the 50 m.g.d. required for the initial stage of the project.

Under the legislation governing the Commission and the municipalities, Title 58, Chapter 5, each municipality is required to finance its respective share of the total capital investment. The average interest rate will therefore vary with the credit responsibility of each municipality. Bonds for this project may be issued by municipalities extending over a 40-year period, pursuant to R. S. 40:1-34. It is estimated that construction would consume a period of 5 years and that moneys during the period of construction can be obtained at approximately 2% interest, because they would be borrowed on a shorter term basis. The following example will illustrate the cost per million gallons, based on a uniform debt service with interest rates of 2½% and 3%, and for the development of the project for 50 m.g.d. and 70 m.g.d.:

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<u>Yield of Project M.G.D.</u>	<u>* Total Cost</u>	<u>Interest Rate %</u>	<u>** Annual Debt Service</u>	<u>Annual Cost of Operation</u>	<u>Cost per M.G.</u>
50	\$50,000,000	3 2.5	\$2,163,000 1,992,000	\$ 600,000 600,000	\$151 142
70	\$57,000,000	3 2.5	\$2,465,820 2,270,880	\$ 700,000 700,000	\$124 116

* Total Cost includes estimated interest during construction.

** 40-year period.

The foregoing illustrates that the ultimate cost per million gallons will depend upon interest rates obtained by the various municipalities and the extent of the development. The additional stages from the Delaware River will similarly substantially reduce the unit cost. The project therefore provides the prospective users with a definite assurance of lower unit costs commensurate with greater usage.

It is important to the present applicants and to prospective applicants that municipal financing at the present time enjoys favorable interest rates. Whether this condition will continue is difficult to forecast. Any increase in interest rates for self-liquidating municipal projects and any increase in construction costs would work adversely to those interested in securing a supply of water.

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VIII

CONCLUSION

When New Jersey was coming into its own as one of the great manufacturing states in this country, there were many who opposed some of the large water developments that have proven so necessary. It behooves those of vision, however, to circumvent these obstacles by acting in accordance with this pressing public need. Unless this is done, northern New Jersey will forfeit part of its birthright.

The Round Valley Project is sound, feasible, and most important, available. Its development can and should be started at once. The Commission therefore urges the present applicants to assist in securing the cooperation of other users to join as early as possible in the initiation of this important water supply project.

TABLE I

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ROUND VALLEY PROJECT

1954 ESTIMATE OF COST

Yield: 50 M.g.d. Delivery at Elizabeth at Elev. 235.

Round Valley Reservoir (Flow line elevation 350,
with available storage capacity of 30,000 M.G.)

North Dam	\$ 2,800,000
South Dam	4,700,000
Northwest Dam (Dike)	3,600,000
Clearing and Grubbing	216,000
Fencing	216,750
Relocation of Roads and Utilities	460,000
	<u>\$11,992,750</u>

Intake Aqueduct

Pumping Station at Hamden	\$ 1,350,000
Force Main from Hamden to Round Valley	2,118,000
	<u>\$ 3,468,000</u>

Headworks

Filter Plant	\$ 1,514,000
Chemical Building	429,000
Administration Building	150,000
Lower Gate House	303,600
Garage and Miscellaneous Buildings	200,000
Booster Pumping Station	880,000
	<u>\$ 3,476,600</u>

Transmission Main

Pipe Line (38 miles of 72-inch pipe)	\$21,700,000
Balancing Reservoir	1,100,000
	<u>\$22,800,000</u>

Real Estate for Reservoir, Pumping Station, Headworks, and Rights-of-Way for Pipe Lines	\$ 3,270,000
Engineering, Legal and Administrative	2,595,900
Miscellaneous Costs	200,000
	<u>\$ 6,065,900</u>

GRAND TOTAL\$47,803,250

TABLE II

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ROUND VALLEY PROJECT

1954 ESTIMATE OF COSTAlternate Plan

Yield: 70 M.g.d. Delivery at Elizabeth at Elev. 235.

Round Valley Reservoir (Flow line elevation 380,
with available storage capacity of 50,000 M.G.)

North Dam	\$ 3,900,000
South Dam	5,700,000
Northwest Dam (Dike)	5,200,000
Clearing and Grubbing	216,000
Fencing	216,750
Relocation of Roads and Utilities	<u>460,000</u>
	<u>\$15,692,750</u>

Intake Aqueduct

Pumping Station at Hamden	\$ 1,350,000
Force Main from Hamden to Round Valley	<u>3,794,750</u>
	<u>\$ 5,144,750</u>

Headworks

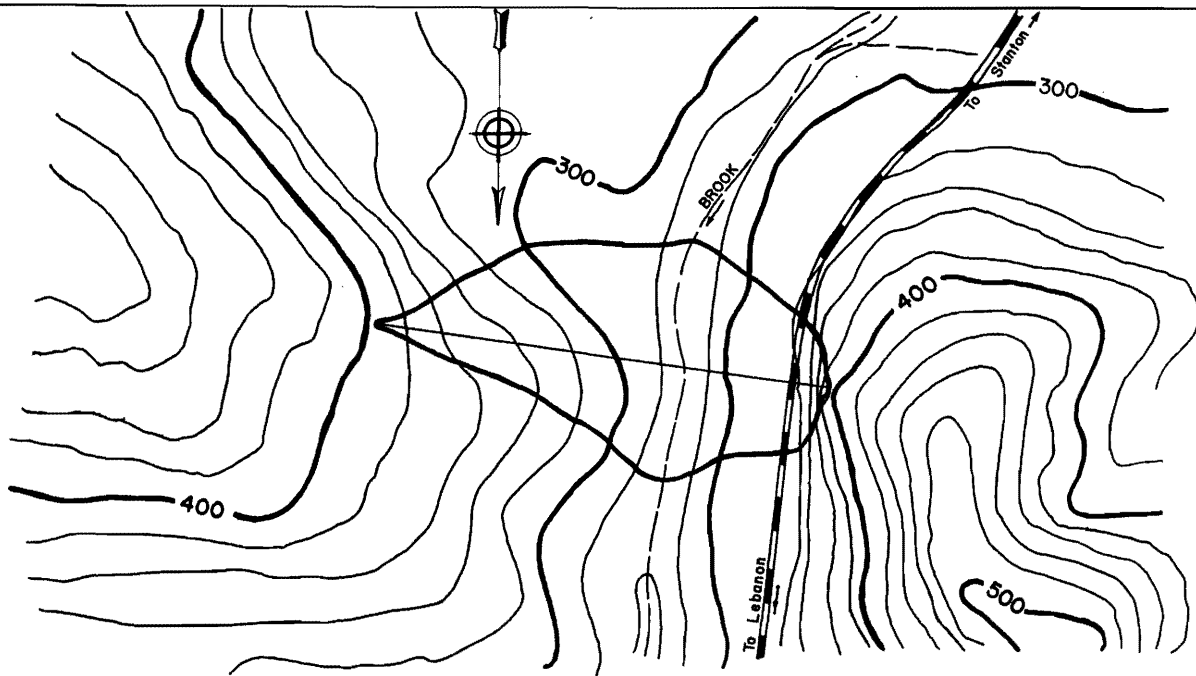
Filter Plant	\$ 1,870,690
Chemical Building	503,375
Administration Building	150,000
Lower Gate House	303,600
Garage and Miscellaneous Buildings	200,000
Booster Pumping Station	<u>880,000</u>
	<u>\$ 3,912,665</u>

Transmission Main

Pipe Line (38 miles of 72-inch pipe)	\$21,700,000
Balancing Reservoir	<u>1,100,000</u>
	<u>\$22,800,000</u>

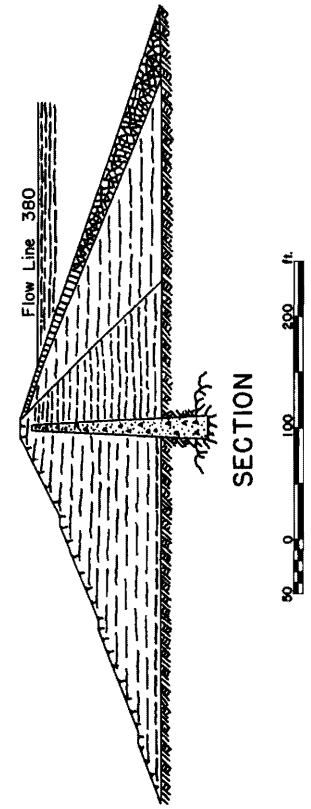
Real Estate for Reservoir, Pumping Station, Headworks and Rights-of-Way for Pipe Lines	\$ 3,270,000
Engineering, Legal and Administrative	3,325,000
Miscellaneous Costs	<u>200,000</u>
	<u>\$ 6,795,000</u>

GRAND TOTAL\$54,345,165

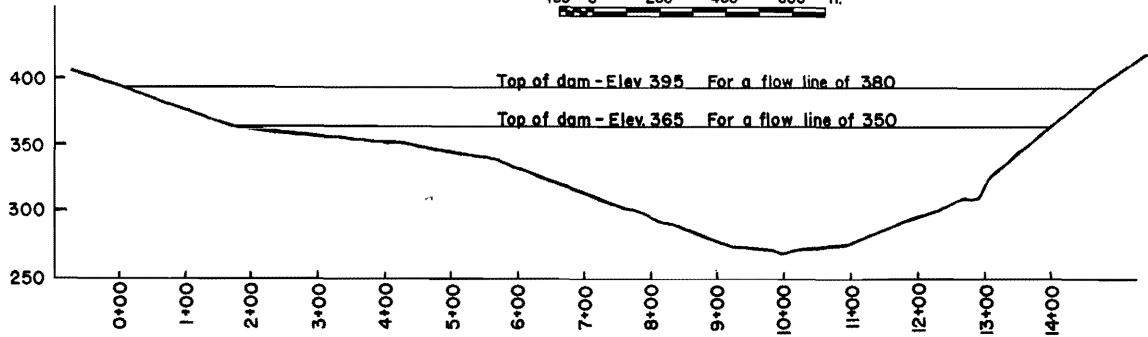


PLAN

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SECTION



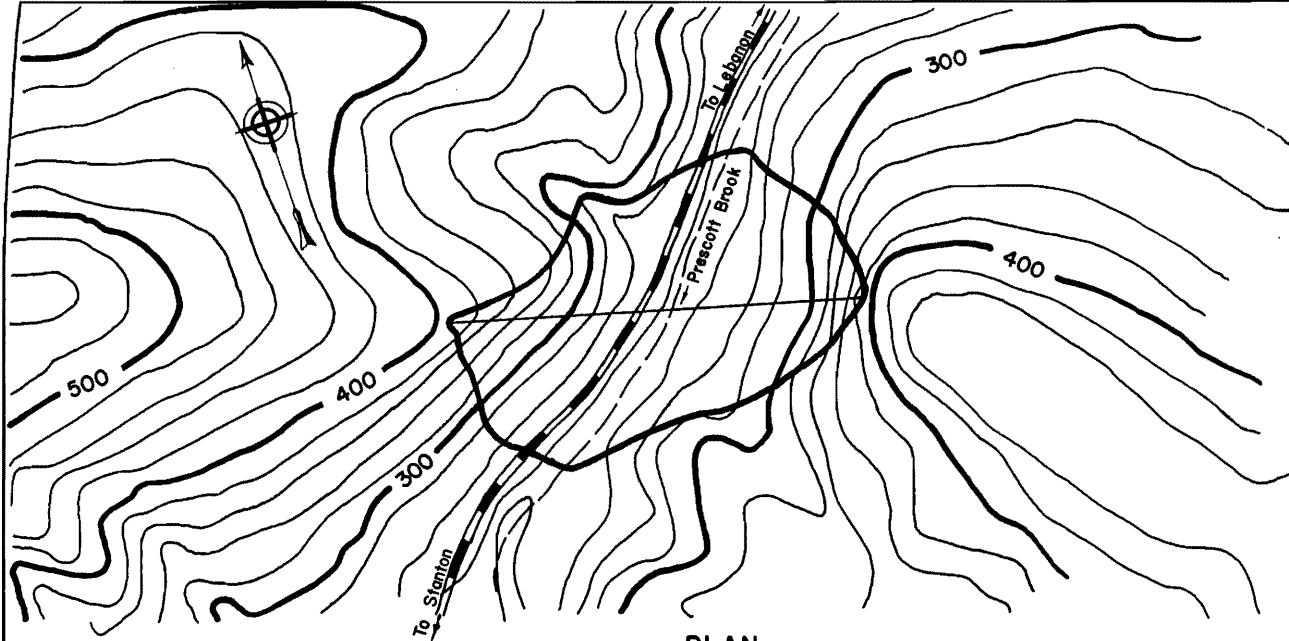
PROFILE

NORTH JERSEY DISTRICT
 WATER SUPPLY COMMISSION
 ROUND VALLEY PROJECT
NORTH DAM
 PLAN, PROFILE and SECTION
 OCTOBER 18, 1954

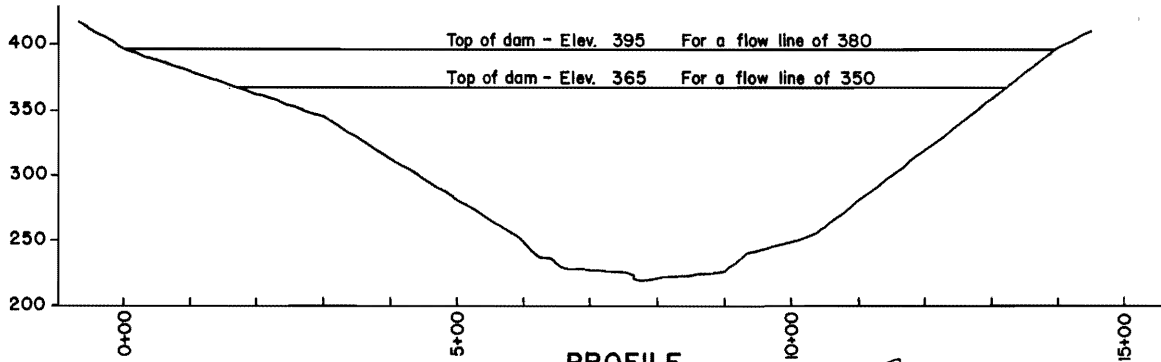
Drawn *SCM*
 Traced *SCM*
 Checked *H.L.G.*

Harold L. Penzler
 Designing Engineer

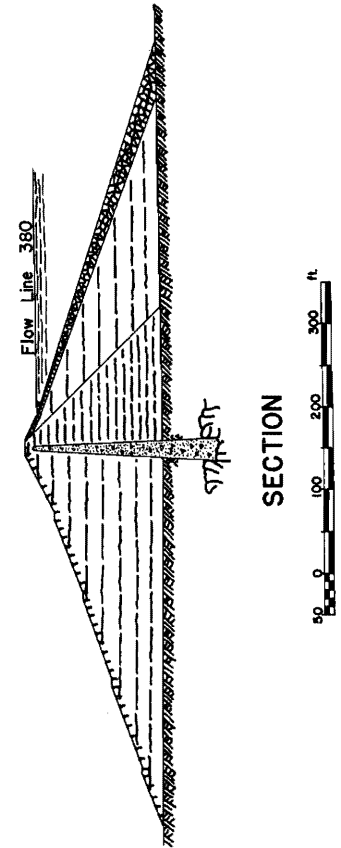
Charles H. Capen
 Chief Engineer



PLAN



PROFILE



SECTION



NORTH JERSEY DISTRICT
WATER SUPPLY COMMISSION
ROUND VALLEY PROJECT

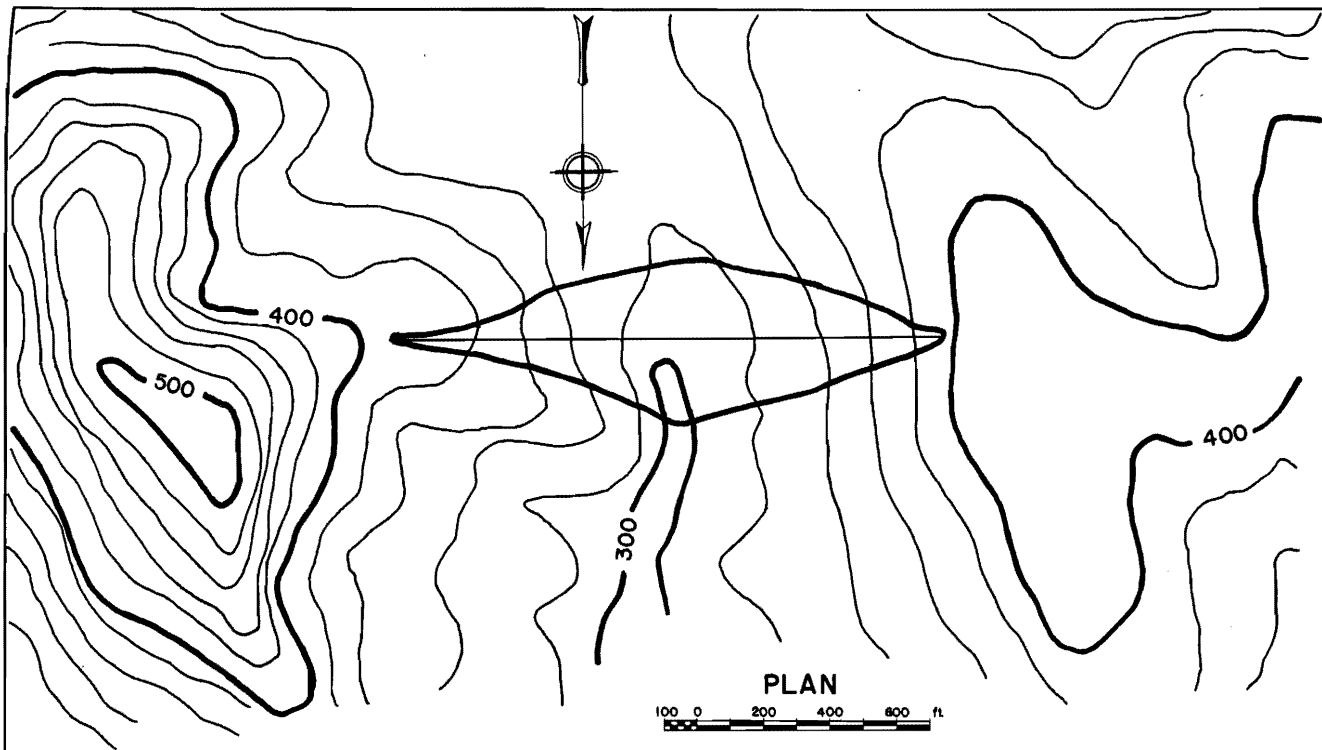
SOUTH DAM
PLAN, PROFILE and SECTION

OCTOBER 18, 1954

Drawn *JKW*
Traced *JKW*
Checked *H.L.G.*

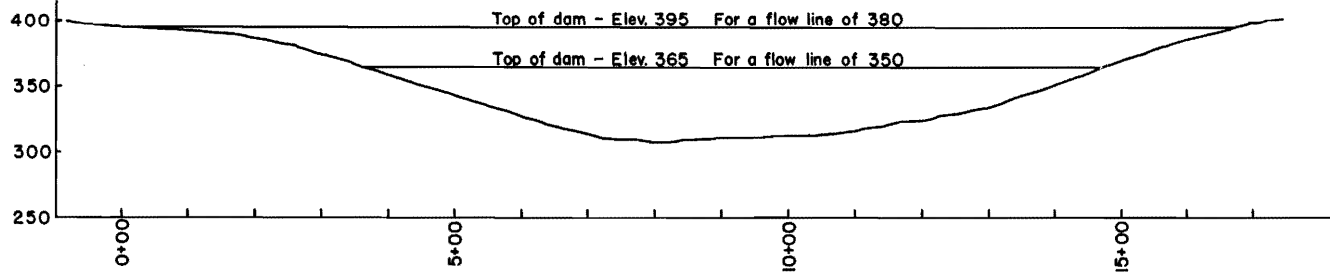
Harold L. Quinlan
Designing Engineer

Charles H. Capen
Chief Engineer

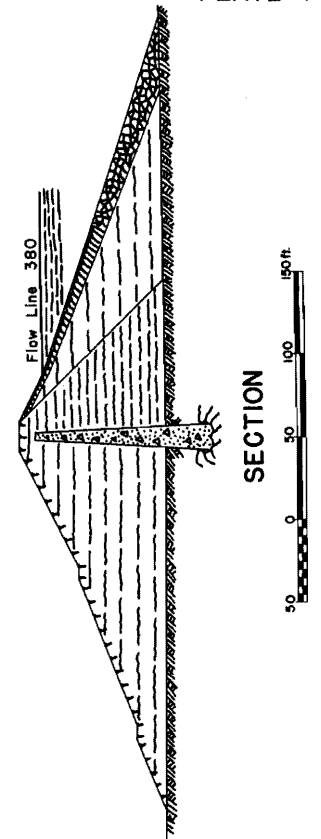


PLAN

100 0 200 400 800 ft.



PROFILE



SECTION

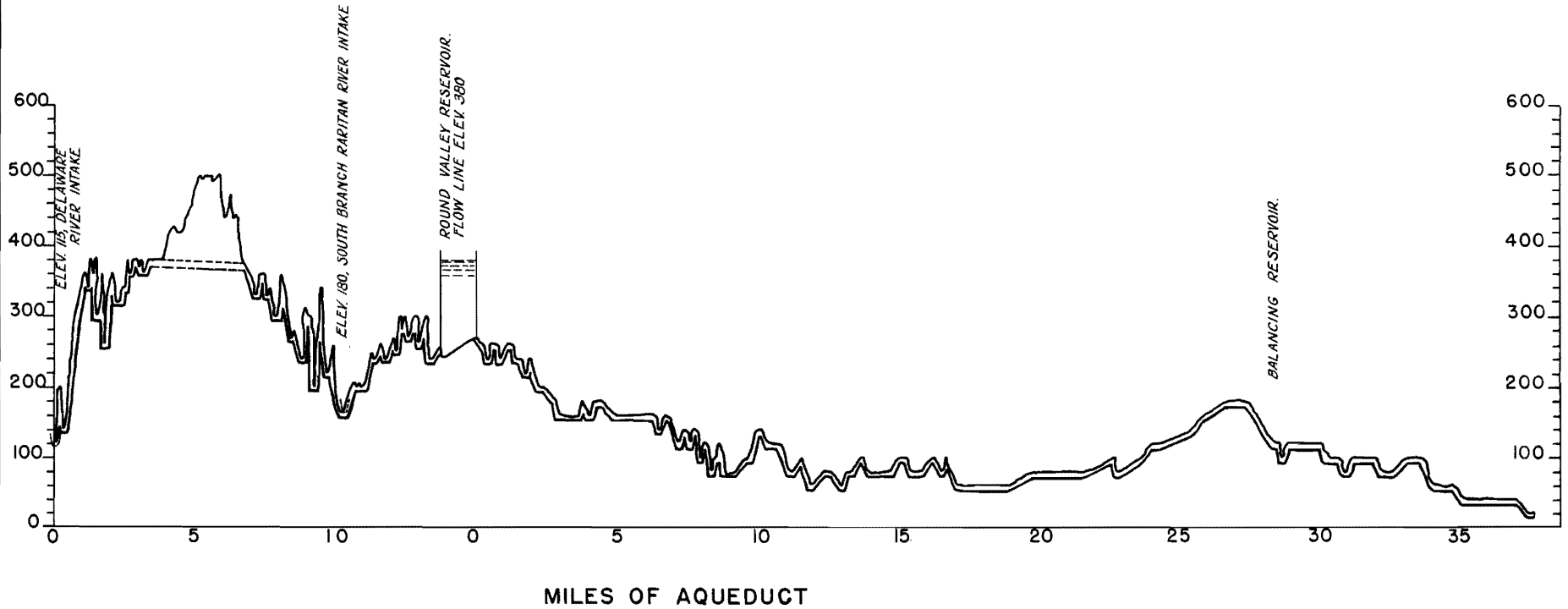
50 0 50 100 150 ft.

Drawn *ACX*
Traced *ACX*
Checked *H.L.G.*

Herold L. Guntzer
Designing Engineer

Charles H. Capen
Chief Engineer

NORTH JERSEY DISTRICT
WATER SUPPLY COMMISSION
ROUND VALLEY PROJECT
DIKE
PLAN, PROFILE and SECTION
OCTOBER 18, 1954



Drawn H.L.G.
Traced H.L.G.
Checked H.L.G.

Harold L. Gwathmey
Designing Engineer

Charles H. Capen
Chief Engineer

NORTH JERSEY DISTRICT
WATER SUPPLY COMMISSION
ROUND VALLEY PROJECT
PROFILE
INTAKE AND TRANSMISSION
AQUEDUCTS
OCTOBER 18, 1954

CASE F DRAW 10 ACC. R.V.26