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**State of New Jersey
State Water Policy Commission**

**Report on the Development of
Adequate Water Supplies for
North and South Jersey**



TO THE LEGISLATURE

February 5, 1945

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State Water Policy Commission

**Report on the Development of
Adequate Water Supplies for
North and South Jersey**

FEBRUARY 5, 1945

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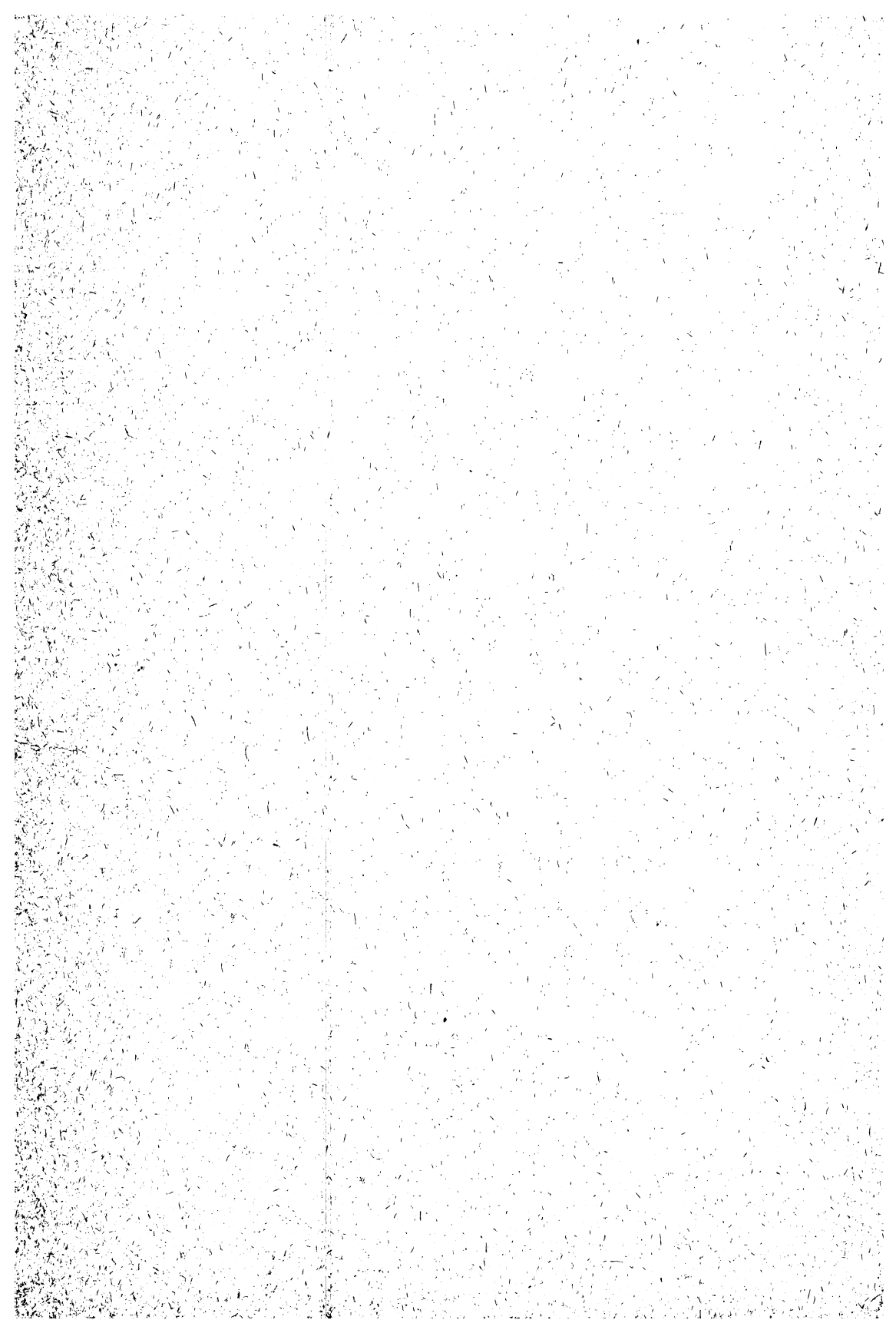
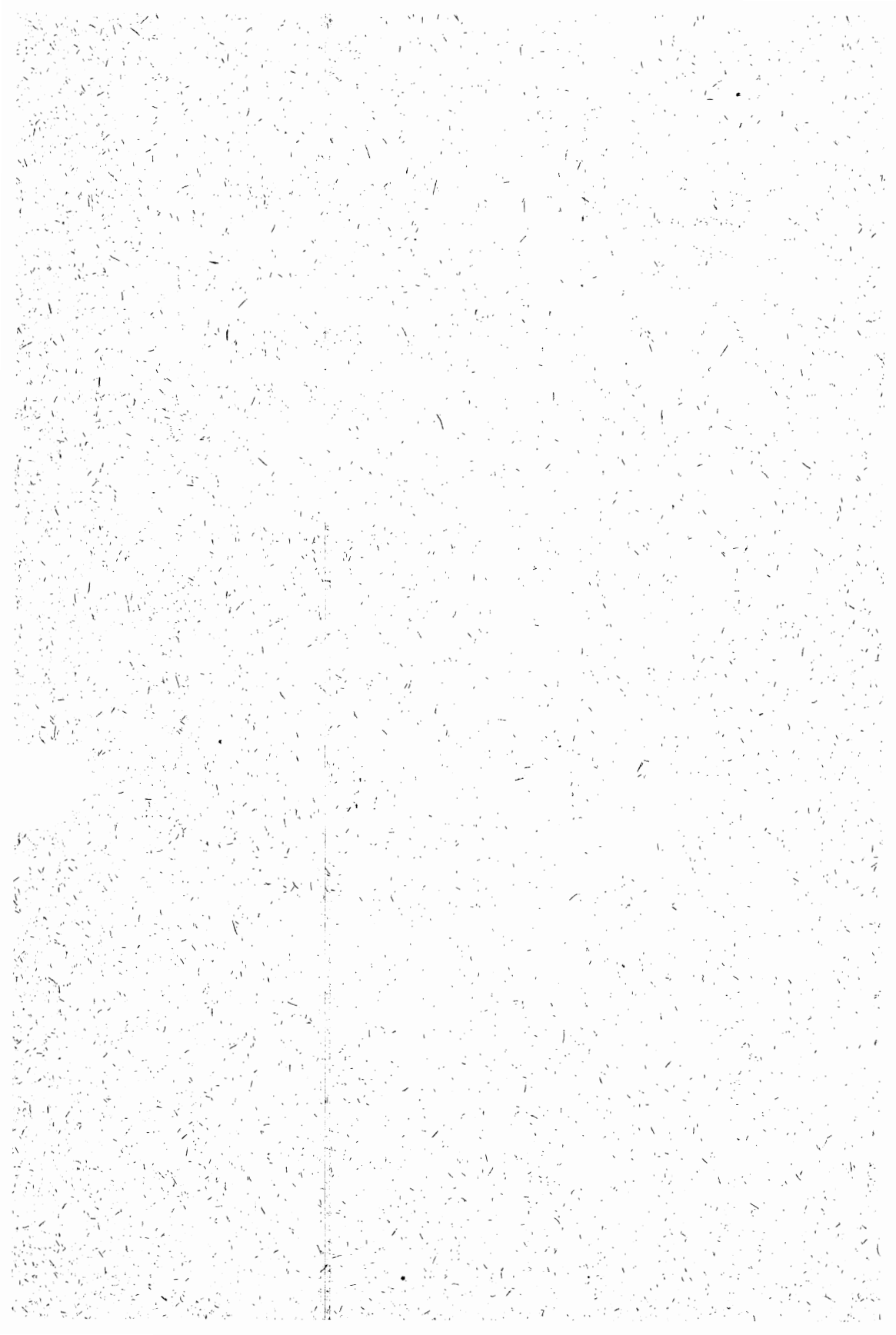


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State of New Jersey
State Water Policy Commission

**REPORT ON THE DEVELOPMENT OF ADEQUATE WATER
SUPPLIES FOR NORTH AND SOUTH JERSEY**

To the Governor and Legislature of New Jersey:

The New Jersey Revised Statutes stipulate that the State Water Policy Commission: "Shall report to the Legislature from time to time the results of its investigations, with plans, to the end that a complete plan be finally presented for the economical and comprehensive development of all the water resources in each of the principal watersheds of the State."

Exigencies of the times call for such a plan now, for these reasons:

1. *North Jersey* (Northeastern industrial counties). Supply systems are carrying an unprecedented load. Resources are being strained to meet demands. Emergency measures will not suffice if consumption pursues its upward trend.
2. *South Jersey*. Surface and underground supplies need comprehensive development to overcome pollution, prevent salt-water intrusion, meet industrial and seashore development, provide irrigation and forest fire protection.
3. *Federal Ship Canal*. The projected canal, if built in accordance with plans thus far revealed, will use up the remaining undeveloped sources of potable supplies available to North Jersey. This is particularly true in respect to the Raritan River watershed.
4. *Post-War Public Works*. Necessity for major public works, to take up expected slack in private employment, can be met in a substantial way by large-scale water supply construction.

5. *Consumption, Post-War Period.* The rise in water consumption during the First World War was followed by a further material rise in the years immediately afterwards. It continued to rise for the next 10 years. In fact, the post-war consumption in North Jersey far outstripped that of the war years which it followed.

6. *Financial Consideration.* The financial stumbling block that heretofore has stood in the way of the carrying out of a water policy for the State, is at least partially removed by the current accumulation of a State surplus dedicated to post-war use.

RECOMMENDATIONS AS TO A WATER POLICY

In view of these exigencies, the Commission recommends as the declared water policy of the State:

1. A North Jersey project capable of yielding 25 million gallons per day in its initial step, 75 million gallons per day in its intermediate step and 145 million gallons per day at full development.

To effect this, we advise:

- (a) That the site at Dock Watch Hollow, in Somerset County, be acquired for a high-level supply reservoir.
- (b) That the site known as Round Valley, in Hunterdon County, be acquired for an intermediate level supply if, and when, the Dock Watch Hollow supply approaches maximum use. This site can be developed in the future when necessary. The two supplies can then be co-ordinated.

2. A South Jersey project, looking to the acquisition of sites on several watersheds in the southern counties for the conservation of the ground-water resources of the shore resorts and industrial areas and for irrigation, fire protection and recreation generally, by the storage of flood waters.

ECONOMICAL AND EFFICIENT PLAN

The development of any major water supply in a series of steps is economically most desirable. The entire yield of the reservoir is never needed at first. Hence, full development at one stroke is undesirable because it necessitates a huge investment of money and heavy carrying charges at once for water that is not being used.

By development in a series of steps the water is obtained only as needed, thus making possible economical operation. Besides, the successive development of smaller facilities makes the water more immediately available.

IMPLEMENTING LEGISLATION

To effectuate this policy, implementing legislation is necessary providing:

1. That the plan outlined in this report be adopted by the Legislature as the basis for developing additional water supplies for the several areas of the State.
2. That the *flood flows* from the headwaters of the Raritan River, including the North and South Branches, and that the *flood flows* from the Musconetcong River, be set aside and dedicated, by appropriate legislative action, for potable and public water supply use to be developed when and as needed.
3. That construction begin as soon as conditions permit, so that a safe, adequate and economical water supply can be assured.
4. That the State Water Policy Commission be directed to prepare the necessary plans and estimates of costs for constructing each project and for acquiring the necessary land.
5. That the laws governing the State Water Policy Commission be amended to give the Commission authority to purchase land necessary to the aforesaid plans.

6. That legislation include limitations and restrictions as follows:

- (a) *Lake Region.* To specify that under no circumstances shall Lake Hopatcong, Lake Musconetcong or Budd Lake be drawn down to add to the supply of potable water. That intakes for water supply be far enough away from the lakes to preclude sanitary restrictions on their use for recreation.
- (b) *Sale of Water.* To provide that water impounded shall not be sold in competition with existing water agencies. The water should be made available directly to those municipalities, commissions and private water companies owning and operating distribution systems. Formulas and prices are matters for agreement between the State and those agencies.
- (c) *Taxes on Reservoir Property.* To provide that taxes on property taken for reservoirs, pipes or other appurtenances be based on 1944 valuations unless and until valuations are generally higher or lower because of changed conditions in the municipality or municipalities in which such property is situated.

The legislation should prohibit taxes on structures added by the State. In the event of disagreement between the State and a municipality as to the proper assessment of valuation for taxing purposes, either party should have the authority of taking the question to the courts.

ADVANTAGES OF THIS POLICY

Among the principal advantages of the foregoing plan are:

It fills a vital need.

It will furnish useful post-war employment when public works are expected to take up the slack in employment.

It preserves inviolate the North Jersey lake region.

It lessens the menace from the recurring floods in regions where they periodically cause great damage.

It makes additional water supplies available in a minimum of time.

It contemplates development in steps as the water is needed, not too far in excess of requirements.

It does not involve a huge investment for distantly future needs.

It floods a minimum of land area and only in sparsely settled sections.

It is insurance against a costly ship canal project, construction of which might be a major disaster for New Jersey.

NORTH JERSEY

Dock Watch Hollow

The plan that follows for the utilization of Dock Watch Hollow originates with the State Water Policy Commission. It is an outgrowth of personal observation of the workings of water intakes in New York and Massachusetts, which suggested that water could be conveyed by gravity to Dock Watch Hollow from a point on the South Branch of Raritan River. The chief engineers of the State Water Policy Commission and of the North Jersey District Water Supply Commission have stated that the operation is a feasible one. (See Plate I.)

According to the engineers, the excess waters of the river may be taken into a catch basin near Middle Valley at an elevation of 500 feet or more. Thence they could be carried by tunnel a distance of less than five miles and thence transmitted by diversion pipe lines another 12 miles to a reservoir with a flow line of 460 feet elevation at Dock Watch Hollow.

The two chief engineers estimate that building the dam for the reservoir, the collecting pipe lines and tunnel and the system of transmission lines to the territory to be served, would take about five years. The reservoir at Dock Watch Hollow would be built to hold 15 billion gallons of water and yield a daily supply of 75 million gallons when supplemented by pumping water from the North Branch of Raritan River.

The Dock Watch Hollow location has been studied by engineers at various periods since 1929. At one time it was considered for a reservoir as part of a Delaware and Raritan Canal potable water supply project but as that project was planned it would have been necessary to pump all the water to it. That would be uneconomical and add a cost in perpetuity to the selling price of the water. For this and other reasons the idea was abandoned.

The method of getting water to it now contemplated will supply the major part of the water without pumping.

Dock Watch Hollow can be made ready for use in the years of reconversion just after the close of the war. Emergency pumping arrangements would make 25 million gallons a day available in about three years, during which time the dam could be completed and the land cleared.

Pumping could be accomplished either from the confluence of the Passaic and Dead Rivers about two miles north of the reservoir; from the North Branch of Raritan River in the vicinity of Burnt Mills, which is a little further away; or from a location on the Raritan River above Bound Brook. The last would require a greater lift and would be the longest distance. Field surveys and full consideration of their respective merits would determine which of these pumping arrangements is preferable.

No equalization reservoir would be necessary. Water could be delivered to a connecting link with the Newark high-level system at a corresponding pressure, as well as distributed to Union and Middlesex Counties and the lower Raritan River Valley.

The utilization of both the North and South Branches of the Raritan River as part of our potable supply would preclude the construction of the ship canal reservoir on the Raritan. The Burnt Mills pumping station, if built, would be in the reservoir basin.

Area required at Dock Watch Hollow would be about 1,500 acres with about 50 buildings to be razed or moved. Land costs were estimated in 1940 at less than \$800,000.

The engineers make a very rough guess that the Dock Watch Hollow Project, with permanent gravity feed and temporary pumping, as herein outlined, would cost around 25 to 30 million dollars for a capacity of 75 million gallons a day.

Construction of the first step—Dock Watch Hollow Project—is proposed for commencement just as quickly as war conditions permit.

Round Valley Project—Hunterdon County

Construction of the second step—Round Valley Project—is a matter for the future—the time for its commencement should depend on the business outlook 5 or 10 years after the war.

Like Dock Watch Hollow, the Round Valley site in Hunterdon County is almost ideally suited for reservoir purposes. Hills form a deep, horseshoe-shaped bowl, requiring the building of but two relatively short dams. Estimated capacity is 42 billion gallons, from which a dependable water supply of 70 million gallons a day could be made available. The area that would be taken is about 3,100 acres.

The flow line at Round Valley would be 370 feet above sea level—ample to supply Somerset, Middlesex and Union Counties by gravity.

Just as at Middle Valley, where the South Branch flood waters would be dropped into a catch basin, thence flow to Dock Watch Hollow—the flood waters that would be too voluminous for diversion at that point would be taken into a second catch basin above High Bridge, thence carried by gravity to the Round Valley Reservoir.

Since the quantity of left-over flood water from South Branch would be insufficient to utilize the Round Valley reservoir up to capacity, a short connection through to Black River above Naughtright would augment the flow of the South Branch, and an auxiliary tunnel through the mountain to a point on the Musconetcong River between Changewater and Stephensburg would further supplement

the waters of the South Branch. This, however, is a potentiality to increase the supply of water if and when future demands make it necessary. Such a step is not contemplated at the present.

This co-ordinated process of storing flood waters (South Branch and North Branch to Dock Watch Hollow; South Branch, Black River and Musconetcong to Round Valley) would save for potable use a vast body of water that now goes to waste.

Some Comparisons

The project herein outlined is superior to those contemplated years ago at Chimney Rock and Long Valley (Bunnvale).

The two storage sites now under consideration have a combined acreage to be converted to water supply use of 4,600, compared with the greater areas of 6,660 acres at Chimney Rock and 7,200 at Long Valley. In the Dock Watch Hollow and Round Valley sites there are no extensive settlements to be destroyed. The valleys are cultivated but farm properties are not numerous.

The combined storage of Dock Watch Hollow and Round Valley would equal 57 billion gallons. Storage at Chimney Rock would have been 45 billion gallons and at Bunnvale 46 billion gallons.

Estimated yield of Dock Watch Hollow when completed with gravity line, plus Round Valley, when completed with its links to take the flood flows of the Musconetcong and Black Rivers, is placed at 145 million gallons daily. The yield of Chimney Rock was placed at 145 million gallons daily and of Bunnvale at 152 million gallons daily.

SOUTH JERSEY

The southern counties get their potable water mostly from wells. Underground waters are adequate for the time being but surface storage at present provided, here and there, is negligible and there is no telling when a supply will give out. Floods in recent years have put several out

of operation for short periods. Shifts in supplies have been compelled by pollution and by the depletion of wells.

The hurricane of September 14, 1944, caused the temporary pollution of several deep wells near the coastline. Test wells are maintained jointly by the commission and the United States Geological Survey in the sand lands back from the shore, from which the long-time yield of underground waters of South Jersey will, it is expected, be ascertained.

The State Water Policy Commission within the past decade has acted on applications for new or additional supplies from 45 municipalities in these southern counties. Grants have been allowed for the taking of 22,874,000 additional gallons per day. The commission is rarely without some South Jersey water supply problem before it.

Consumption of water in the South Jersey counties is now 15.62 million gallons a day more than it was in 1933, an increase of 33 per cent in 10 years.

There are several rivers in South Jersey with an abundant flow in flood seasons which could be impounded without unwarranted cost.

The Great Egg Harbor River at Mays Landing has 216 square miles of watershed. Batsto River has a drainage area of 70 square miles. Mullica and Wading Rivers, above tidewater, have about 412 square miles. Impounding the waters of any of these streams would not be difficult. Each could afford a generous supply of good, potable water.

The Mullica-Wading Rivers could be impounded up to 106 billion gallons, yielding over 300 million gallons daily. Such a quantity is far beyond the likely requirement of potable water but it could be utilized as an effective fire break and a source of emergency water to a long coastal stretch, while at the same time serving a wide inland area. (See Plate II.)

Besides the question of adequate potable water, the matter of irrigation and fire protection would seem to justify consideration. Droughts periodically cause serious losses.

Hardly a year passes that does not see extensive forest lands laid waste by destructive fire.

These rivers have been studied many times. Their possibilities are set forth at length in a 1909 report of the State Geologist, in the Hazen report of 1922, in the Vermeule and more recent reports on a water supply for the City of Philadelphia.

Investigation of ground waters in New Jersey has disclosed that 30 per cent of the total consumption is obtained from these sources. The principal areas dependent on wells are in South Jersey, Monmouth and eastern Middlesex Counties. In general, this area includes that portion of New Jersey southeast of the main line of the Pennsylvania Railroad between Trenton and New Brunswick. The heaviest drafts are in the Sayreville, Camden and Atlantic City areas.

Careful observations over a period of 20 years show that these three areas have increased their output of water until their future use must be guarded from overdraft and protected from the danger of salt-water intrusion. The latter danger has arrived in the Sayreville and Atlantic City regions and along the Delaware Valley below Camden.

In Gloucester and Salem Counties recent industrial development has thrown a heavy load on wells.

Future growth depends upon protecting the quality of the water and finding new areas for ground-water development. The Commission has been able to control draft from public supplies through existing laws. Draft through private supplies cannot be so controlled, but fortunately much control has been accomplished through the co-operation of private industrial users. Much, however, remains to be done towards protecting these valuable sources of supply.

Overdraft lowers the ground-water table and reverses the direction of flow near tidal waters, bringing in salt water.

Atlantic City Area

In the Atlantic City area, where wells in the 100-foot horizon have drawn in salt water, it is proposed to build

a surface water reservoir on Absecon Creek and flood the salt marshes with fresh water to raise the ground-water level and push back the salt water. This would restore to use wells now abandoned and assure their future usefulness, as well as increase the yield of the 100-foot horizon.

Delaware River

Along the Delaware River below Camden large supplies of water for public and industrial use are taken from wells. The draft has increased greatly and the ground water has been permanently lowered. Salt-water intrusion has occurred in two industrial well fields. An existing reservoir on Salem Creek has helped the situation, but more protective measures should be taken. Other fresh-water reservoirs in this area, especially on Lower Salem Creek, should be built.

These and other new reservoirs in areas of large ground-water draft would not only enlarge the quantity and protect the quality of ground water, but would be of value for irrigation, fire protection and recreation.

MIDDLESEX-MONMOUTH COUNTY REGION

A similar project is suggested for the Sayreville area, in eastern Middlesex County, where wells in the so-called Farrington sand have drawn in salt water. A fresh-water reservoir on Deep Run and South River below Old Bridge would keep out tide water from Raritan Bay and flood salt marshes with fresh water, thus protecting wells in that highly developed area from contamination, and increasing the yield. (See Plate I.)

The City of Perth Amboy, and several large industries with independent supplies, obtain their water supply from this area.

Here again, the proposed ship canal would seriously interfere with this valuable source of water and it is possible this interference might extend down into Monmouth County.

INADEQUATE STORAGE—NORTH JERSEY

The months of almost no rain in the summer of 1944 were preceded and followed by an abundance of it. We entered the drought with full reservoirs that service the northeastern industrial counties. Then the months of dry weather left them so depleted that the combined quantity of water stored by the four largest supply systems, serving hundreds of vital war industries, dwindled to the lowest level since they were built. Co-operative rationing would have been necessary had the drought been prolonged much longer. That was avoided by the timely precipitation in November. We have been through a similar experience three times in 12 years.

The reason is—the area depends too largely on wells and river-intakes, without storage, for its supply of potable water. The water stored for dry-weather requirements is inadequate. Comparison with New York and Massachusetts water supplies illustrates that truth.

Storage Capacity of Main Reservoirs

	<i>Gallons</i>
Northern New Jersey	53,300,000,000
Metropolitan Boston	415,000,000,000
New York City (after Delaware project completion)	480,000,000,000

These are thickly populated, heavily industrialized—comparative and competitive—business sections of the United States. The Boston section, with fewer people and industries, has eight times as much stored water as Northern New Jersey; New York City, with $2\frac{1}{2}$ times as many people, has $9\frac{1}{2}$ times as much water storage.

While the district has not yet run out of water in times of drought, it has come too close for comfort. There should be a larger volume in storage as insurance against that sort of a contingency. The alternative is to continue the gamble, which has persisted, and trust to luck that droughts will always terminate before the water is used up.

There are two other reasons why it is appropriate at this time to consider and adopt a water policy for the State; namely, the proposed ship canal and the rapidly increasing water consumption.

SHIP CANAL THREAT TO WATER RESOURCES

The threat of a Federal ship canal across the waist of the State has faced us with the stern fact that we may be deprived of water resources necessary to the growth of New Jersey. The reservoir-feeder, mapped by the Army Corps of Engineers, would divert to the purposes of the canal the remaining undeveloped sources of potable water from intrastate streams in North Jersey from which a good supply is still obtainable. Nothing would remain to the northern counties, save opportunities to extend existing developments. These sources had better be retained as a means of last resort. Present supply owners have not thought well enough of them to spend their own money on them.

If the State of New Jersey is to save to itself these sources of a future water supply based on the Raritan River, it must do something about them. Protests—no matter how vociferous—will not suffice. Action is necessary.

The State Water Policy Commission, in a Senate resolution August 12, 1943, was asked for advice about the ship canal as it concerned water supply. The Commission stated in reply, among other things:

“It seems to us that the State’s policy respecting water supplies should be determined without further delay. Sources of subsequent water supply in the watershed of the Raritan River would be denied to the State. The same might be true of the watershed of the Delaware River, though that is not so obvious. There should be a decision, at an early date, as to whether the Delaware or the Raritan watershed is to be tapped first. Whatever plan is arrived at, it should set forth the State’s purposes respecting each of these watersheds.”

The Commission added this warning note:

“It is evident (with the increasing requirements of war industries) that only a combination of heavy rainfall, good management and freedom from accidents and sabotage can save the district (North Jersey industrial counties) from a water shortage in 1944.” Luckily, we had the combination. Rainfall broke the drought. The management of individual water supplies, in co-operation with the Joint Operation Board set up by the State Water Policy Commission in 1942, was excellent. There were no serious accidents or sabotage.

INCREASING WATER CONSUMPTION—NORTH JERSEY

That lucky combination of occurrences is the reason why the supplies were able to deliver an average of 376,540,000 gallons of water daily throughout the month of August, 1944. The month of July, with an average daily delivery of 371,080,000 gallons, and the month of September with 359,080,000 gallons, were not far below the August peak load. Average daily delivery for past five years was as follows: (See Plate III.)

1940	270,770,000 gallons
1941	303,330,000 gallons
1942	309,110,000 gallons
1943	331,730,000 gallons
1944	346,550,000 gallons

When defense industries commenced to function in April, 1940, the district was taking 263,620,000 gallons a day.

From these figures it will be seen that there was an increased consumption in the five-year war period of 75,780,000 gallons a day. That is 28 per cent. How high it will rise in 1945, none can say.

MILLION
GALLONS
USED
DAILY
400

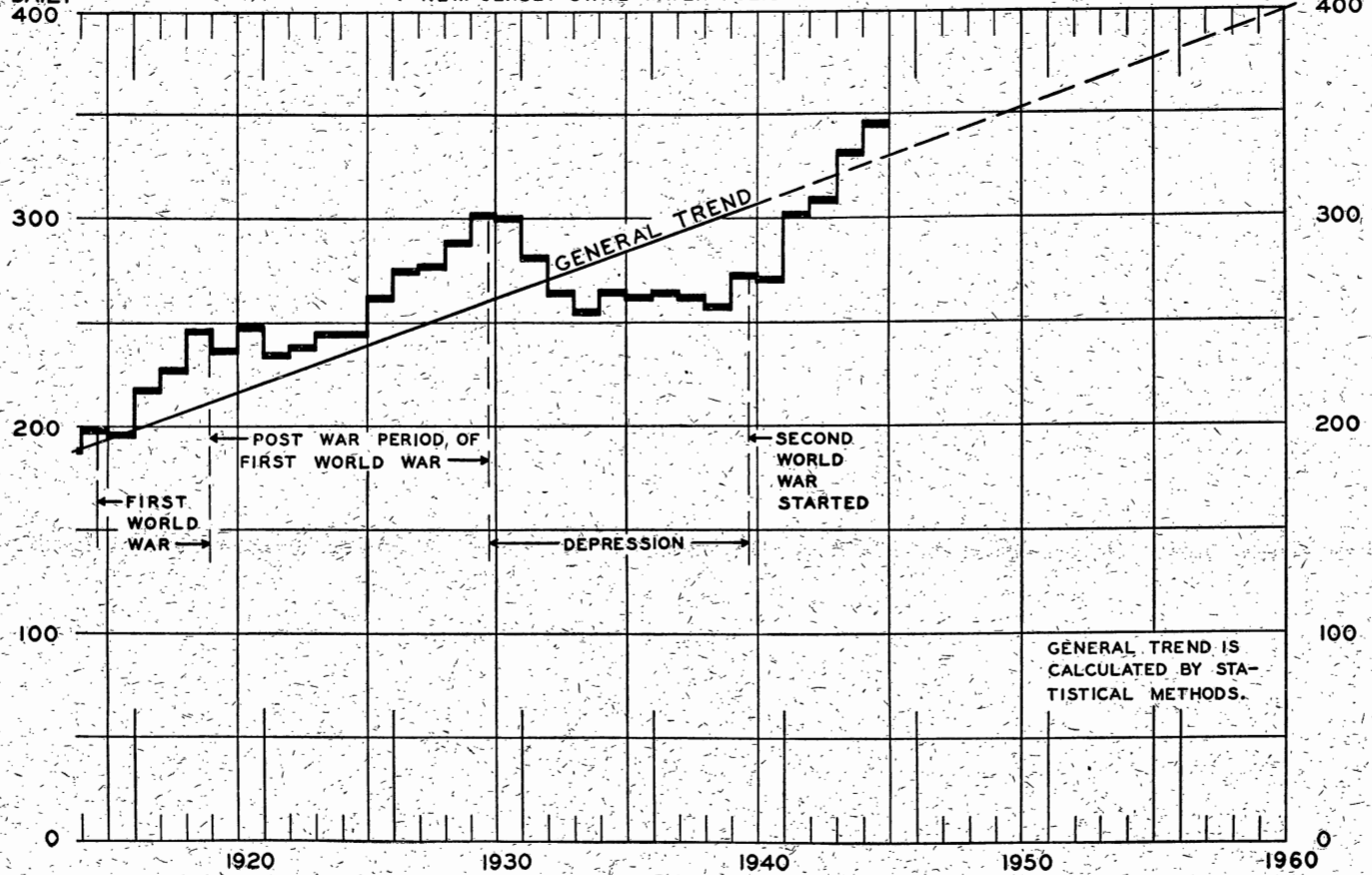
WATER CONSUMPTION

NORTH JERSEY DISTRICT

NEW JERSEY STATE WATER POLICY COMMISSION

PLATE III

MILLION
GALLONS
USED
DAILY
400



POST-WAR CONSUMPTION

The prophecy has been made that water demands will drop tremendously with the end of the war. That is a speculation predicated on the assumption that industrial production will be decidedly curtailed. Post-war planning for reconversion looks to the avoidance of a serious recession. All we have to go by, however, is the fact that industry took a new lease on life after World War No. 1—jumped water consumption 57,280,000 gallons a day *above that of the war period*. The pace did not slacken until the business depression overtook us.

Whatever may happen to industrial requirements in the munitions line—the resumption and extension of air conditioning, better housing, improved sanitation, airplane engine testing, wider application of chemical discoveries, and numerous other processes of manufacturing for civilian purposes, point to little, if any, curtailment in the use of water.

FORMER PROJECTS

(a) *Bunnvale*

The State Water Policy Commission, well over a decade ago, with a different membership, recommended the appropriation of Long Valley as a reservoir site, with an impounding dam at Bunnvale. The South Branch of Raritan River flows through the valley. Its flood waters could be collected on the river which, in itself, is both a physical advantage and an economy. Viewed solely as a large, single engineering project, that recommendation is as sound as ever.

There are other factors, nevertheless, that make it undesirable. One is the extent of the area to be flooded, including surrounding land required for protective purposes. This area amounts to 7,200 acres and it includes five, though small, populated centers (Califon, Vernoy, Middle Valley, Long Valley, Naughtright). There were, at the time, 520

buildings on it. A railroad traverses the valley. The cost of purchasing necessary properties for the reservoir was estimated at \$5,500,000. County boards of freeholders of Morris and Hunterdon Counties were aroused over threatened loss of taxable realty.

A diversion intake from Musconetcong River, close to the outlet of Lake Hopatcong, was included in the plan. While the intake was intended to intercept none but overflow water, yet it served to arouse opposition based on memories of days when the lake was drained via the Morris and Essex Canal to keep the Passaic River Water Works at Little Falls in operation.

(b) *Chimney Rock Project*

The North Jersey District Water Supply Commission long agitated for the location of a reservoir at Chimney Rock in Somerset County. This site has no watershed of consequence. Water would have to be brought to it from the North and South Branches of the Raritan—from probably additional sources. There are two settlements (Martinsville and Warrentonville) on the location and the acreage is 6,660. Buildings counted, when the proposal was advanced, numbered 322. Bound Brook Water Company holds perpetual rights to the watershed. There is no way of telling what it would take to acquire that right. The company has a small reservoir on the premises. Property of the company would have to be purchased—perhaps in its entirety.

BUNNVILLE AND CHIMNEY ROCK OBSOLETE

The State Water Policy Commission is convinced that neither the Bunnvale Project nor the Chimney Rock Project is either practicable or desirable. The value of the real estate involved, and the greatly increased needs for recreation, render it imperative to take only the flood flows from these streams, and to impound this water in reservoirs located in thinly populated areas.

START OF THE WORK

The work in both North Jersey and South Jersey can proceed, in two respects, as soon as the money becomes available. Land can be bought and plans prepared. Construction of dams, pumping facilities and transmission lines must await the lifting of manpower and material restrictions.

The site at Dock Watch Hollow, together with one or more in South Jersey, should be procured now. The site at Round Valley should wait.

The flood waters of the North and South Branches of the Raritan River should be allocated now to potable water development to prevent their diversion to other use, such as that of the ship canal.

Land purchases and clearing of sites could be accomplished for an estimated \$2,000,000. Assembling of large tracts, with the customary purchasing difficulties, is a slow process. Valuable time will be saved by getting it under way well ahead of construction operations.

Surveying, drafting and preparation of cost figures, if commenced promptly, can be finished in season for construction purposes without delay when war is over. The State Water Policy Commission has a considerable quantity of suitable engineering equipment on hand and its engineering staff is sufficiently diversified in knowledge and training for the task.

Respectfully submitted,

(Signed) FORSTER W. FREEMAN,
ERNEST J. HOWE,
THURLOW C. NELSON,
GEORGE S. BURGESS, *Chairman.*

Attest:

JOHN WYACK, *Secretary.*

February 5, 1945.

