CN Colts Neck 25-Sept.-84

Engineer's Report Accompanying Application for Diversion Monmouth Consolidated Water Company.

pgs = 28

Report Author: James P. Scott

CN 000 041 E

CN000041E

Dr. 28 end
3/9/85 - EDS

Monmouth Consolidated Water Company

661 Shrewsbury Avenue, Shrewsbury, N.J. 07701
201/842-6900

Paul Burdan/Vice President & General Manager

File: 420-171

HAND DELIVERED

September 25, 1984

Mr. Ernest L. Hardin, Manager
Water Allocation Office
N. J. Department of Environmental Protection
Division of Water Resources
P. O. Box CN-029
Trenton, NJ 08625

Dear Mr. Hardin

RE: Diversion Application Request

Here for your review are the following items:

1. Standard Application Form CP-1 (each location)
2. Form DWR-084 (each location)
3. Form DWR-085 (each location)
4. Engineer's Report
5. Hydrogeologic Investigation

We would appreciate your timely review of this application. If additional information is required, please let me know.

Cordially

Paul Burdan

sd

Enclosures

ENGINEER'S REPORT

ACCOMPANYING APPLICATION FOR DIVERSION

MONMOUTH CONSOLIDATED WATER COMPANY

A. SUMMARY - PROPOSED DIVERSIONS

1) Modify W.S. Permit number 5019 to permit the diversion of a combined total of 3 MGD from wells number 4 and number 6 and increase the total allocation to 385.02 MGM.

2) Issue a new permit to allow a Magothy-Raritan diversion of 62 MGM at Glendola Reservoir from May 1 to November 15.

3) Issue a new permit to allow the diversion of 5 MGD from the Manasquan River from January 1, 1986 through December 31, 1988. Permit provisions are requested to allow the Manasquan allocation to increase to 10 MGD on January 1, 1989 and run to December 31,1995. At that time an increase in Manasquan diversion rights to 15 MGD, beginning January 1, 1996 and running for the life of the permit is requested.

B. GENERAL

The Monmouth Consolidated Water Company supplies potable water for use to an extensive service area of Monmouth County, New Jersey. The territory served covers about 120 square miles of area. The system spans approximately fifteen (15) miles along the Atlantic Coast, from Sandy Hook to Shark River and ranges inland up to nine (9) miles. Numerous residential and commercial centers, as well as a number of popular shore resorts are served. Located within communting distance of New York City and having excellent highway and transportation facilities, future prospects for a continued high growth appear assured.

Communities served include the Cities of Long Branch and Asbury Park; the Townships of Middletown, Neptune, Ocean and a portion of Holmdel; the Boroughs of Bradley Beach, Deal, Eatontown, Fair Haven, Interlaken, Sea Bright, Shrewsbury, Tinton Falls, Little Silver, Monmouth Beach, Neptune City, Oceanport, Rumson, West Long Branch, part of Red Bank, and the Village of Loch Arbour. The Water Company also has interconnections with the Boroughs of Allenhurst and Avon and the West Keansburg Water Company. The estimated population served directly as of year end 1983 was 249,318. The number of customers served rose to 64,845, representing a two (2) percent increase from 1982. All customers are metered.

The Water Company houses Administration, Distribution, and Commercial personnel at the Operations Center located on Shrewsbury Avenue. Production, operation and maintenance personnel are housed at the Swimming River Station in Colts Neck which is the control center for production operations.

The average daily output delivered to the distribution system has shown an average annual increase of 0.58 MG over the 33 year period ending in 1983, reaching 27.893 MGD in 1983. The maximum day record delivery was 56.6 MG which occured on June 28, 1976. The maximum day delivery for 1983 occured on July 17, and was 54.222 MG.

Approximately ninety (90) percent of the water supply of the Monmouth Consolidated Water Company is obtained from three (3) surface sources, Swimming River, Shark River and Jumping Brook, with the balance derived from existing wells.

C. EXISTING FACILITIES

1. Sources of Supply - Surface

Swimming River Reservoir, the principal surface source, is an on-stream reservoir developed on the Swimming River,a tributary of the Navesink River. This reservoir has a storage capacity of 2.6 billion gallons with a contributing watershed of about 43 square miles. The earth and concrete dam

was originally constructed in 1901 and raised to 35 feet in elevation in 1962,thus increasing the reservoir capicity from 290 million gallons to its present capacity. Raw water is withdrawn from a multi-level concrete intake structure and delivered by pumping to the Swimming River Filter Plant located adjacent to the reservoir in Colts Neck Township.

The Glendola Reservoir in Wall Township has a capacity of 1.0 billion gallons and is operated as an offstream storage facility to provide storage for water pumped from the Shark River and Jumping Brook. These two river systems have a combined drainage area of 16 square miles. A 36-inch transmission main, about one (1) mile long connects this reservoir with the Jumping Brook Treatment Plant. A low diversion dam and concrete intake structure on Shark River, midway between the storage facility and treatment plant, deliver pumped water into this raw water transmission main. Water from the two wells, Numbers 4 and 6, and wastewater supernatent at Jumping Brook Station can also be pumped to Glendola Reservoir when the treatment plant is not operating.

2. Source of Supply - Wells

Source of supply from ground water is currently located at the company's Jumping Brook Station and at the Ocean Grove Station, both of which are located in Neptune Townsnip.

The well at Ocean Grove pumps directly into the distribution system with the only chemical treatment being chlorination. The two Jumping Brook Wells, (numbers 4 and 6), drilled to the Raritan Formation, are pumped via two pumps of one MGD and two MGD, respectively, to the Jumping Brook Treatment Plant, or when the plant is not in operation, to the Glendola Reservoir. The one MGD unit pumps to the reservoir via transfer pump number 9; the two MGD unit pumps to the reservoir directly.

Because Raritan formation water has an iron content of approximately ten to fifteen milligrams per liter, water from these two wells is diluted with surface water before it is treated at the plant to minimize treatment problems.

3. Treatmemt
   Clearwater Storage
   Pumping Units

Swimming River Treatment Plant

The Swimming River and Jumping Brook Stations provide filtration treatment and clearwater storage. The Newman Springs Station provides clearwater storage and pumping. Ocean Grove Station is an unmanned facility providing only chlorination to the water pumped from its well. Clearwater storage is no longer available at this station.

Swimming River Plant contains the system Control Center and is located in Colts Neck, adjacent to the Swimming River Reservoir. Constructed in 1972 and expanded in 1981, the treatment facility has a continuous rated capacity of 36 MGD and a maximum day capacity of 42 MGD. The raw water receives chemical application and is conveyed to six purification units which provide flocculation, clarification and filtration.

Water is delivered by gravity from the purification units to a 1.5 MG clear well located beneath the control building. From this clear well, water may be transferred by gravity through a 36-inch transmission main to the Newman Springs storage and distribution pumping facility, pumped directly to the Main Service District distribution system by three (3) pumps with a combined rated capacity of 21 MGD, or pumped to the Middletown Gradient distribution system by four (4) pumps with a combined rated capacity of 16 MGD.

Wastewater at the treatment plant consists primarily of sludge from the clarification process and filter backwash water. Waste solids are discharged from the sludge hopper of each purification unit through a gravity drain to either of the two sludge drying ponds, one of 0.69 MG capacity and the other of 0.65 MG capacity.

The filter backwash water is settled in two 140,000 gallon clarifer tanks from which the sludge is pumped to the drying ponds. Supernatant from these ponds and the clarifier tanks is recycled through the treatment plant.

Periodically, sludge is removed from the drying ponds and is taken away by private carters.

The Newman Springs Station is a storage and distribution facility which is used in conjunction with, and controlled from the Swimming River Station. A 36-inch main, delivers treated water by gravity from the Swimming River Station to three clearwater basins with a combined capacity of 4.125 MG and a 1.0 MG clearwater standpipe at Newman Springs. Water is pumped from Newman Springs Station by six high-lift distribution pumps into the Middletown and Main Service District distribution grids. Three of the pumps, with a combined rated capacity of 18 MGD, feed the Main Service District. The other three pumps can deliver 16 MGD to the Middletown Gradient. A standby generator provides the power for running any three of the six pumps during power outages.

Jumping Brook Station

The treatment facility at Jumping Brook Station has two purification units providing flocculation, clarification and filtration. These units have a total continuous rated capacity of 10 MGD and a maximum day capacity of 15MGD. There is space for two additional units. Following treatment, water flows by gravity into a 530,000 gallon clear well beneath the station from which it is pumped into the Main Service District distribution system by four (4) high-lift pumps with a total rated capacity of 22.5 MGD. A standby diesel-powered pump of 3 MGD provides power-outage capability.

Sludge and wash water are withdrawn to a 300,000 gallon clarifier. The settled sludge is then diverted to a masonry lagoon with a 0.7 MG capacity from which supernatant can be recycled. The clarifer supernatant is recycled through the treatment plant. Periodically, sludge is removed from the lagoon and is taken away by private carters.

Ocean Grove Station

Raw water from the Mt. Laurel Formation well at the Ocean Grove Station requires no treatment other than chlorination. Following chlorination by means of a single unit, water is delivered directly into the Main Service District.

System Clearwater Storage

The system has treated water storage facilities with a total capacity of 20.63 MG. The various storage units and the respective capacity of each are listed below. In addition to these facilities, there are three wash water tanks which store a total of 1.836 MG of treated water at Swimming River Plant and Jumping Brook Plant.

Clearwater Basins

	Station/ Location	Construction Material	Year Built	Capacity in MGD
1.	Newman Springs	Concrete	1982	3.000
2.	Newman Springs	Concrete	1980	0.125
3.	Newman Springs	Concrete	1951	1.000
4.	Newman Springs	Steel (SP)	1955	1.000
5.	Jumping Brook	Concrete	1962	0.530
6.	Swimming River	Concrete	1972	1.500

Distribution Storage

7.	Water Witch	Steel	1982	0.300
8.	Middletown Twp.	Steel	1951	1.170
9.	Sunset Ave.	Steel	1967	5.100
10.	Navesink	Steel	1968	1.400
11.	Rumson	Steel	1968	2.350
12.	West Park	Steel	1968	0.500
13.	Red Hill	Steel	1968	0.750
14.	Middletowm-Lincroft	Steel	1968	1.400
15.	Holmdel	Steel	1970	0.500

4. Water Allocation Permits
   Safe Yield

Monmouth Consolidated Water Company currently holds two allocation permits to divert water from several surface and groundwater sources. Permit No. 5018 authorizes the Company to divert a maximum of 775 million gallons per month from Swimming River. Permit No. 5019 allows the diversion of 354 million gallons per month from Jumping Brook, Shark River, Well No. 21 in Ocean Grove, and Wells No.4 and No. 6 at Jumping Brook Filter Plant. The permit establishes an allocation of 1.20 MGD at Well No. 21 and a combined allocation of 2 MGD for Wells No. 4 and No. 6. Expressed as an average daily rate these permits allow the Company to divert 36.42 MGD.

The safe yield for the Company's surface sources have been calculated. Allowing for losses (i.e. evaporation), and downstream release requirements, the safe yield of Swimming River Reservoir is 22.8 MGD. The Shark River-Jumping Brook-Glendola Reservoir system has a safe yield of 8.0 MGD, allowing for losses and downstream release requirements. The total safe yield for surface sources is therefore, 30.8 MGD. This figure is based on the yield available during a recurrance of the minimum sustained 137-day low flow likely to occur once in twenty years. These criteria provide a 95% reliability during any given year.

The dependable yield of the Company's groundwater sources totals 3.5 MGD. Well No. 21 has capacity of 0.40 MGD although diversion rights exist for 1.2 MGD. Wells No. 4 and No. 6 have a dependable yield of 3.1 MGD but the current diversion right is 2 MGD. Given the 3.5 MGD dependable yield of groundwater sources and the 30.8 MGD safe yield of surface water sources, the total safe yield available to Monmouth Consolidated Water Company is 34.3 MGD. Surface supplies, therefore, make up 89.8% of the system's yield and groundwater sources provide 10.2% of the total yield.

D. SOURCE OF SUPPLY NEEDS

Though the company's intent is not to construct facilities to back up other systems, the fact remains that a failure of one of these adjoining systems or lack of adequate local supplies in these adjoining areas would have an impact on Monmouth Consolidated Water Company and its supply requirements. The company anticipates future service requests from surrounding water suppliers.

Monmouth Consolidated Water Company served an estimated population of 249,318 as of year end 1983. The service population has been rising steadily and it is projected to continue at a brisk pace through the year 2000. Estimates of the future service population for the Company's existing service area were developed for 1985, 1990, 1995 and 2000. These are shown in Table 1 along with estimates of the number of customers anticipated in each milestone year, the gross per capita consumption in gallons per day, and the projected residential per capita use in gallons per day.

Table 1

Projected Population and Customers

Monmouth Consolidated Water Company

Year	Population	Customers	Per Capita Use (GPCD)	Residential Use (GPCD)
1985	258,000	67,013	120.2	69.44
1990	277,135	71,983	120.7	69.44
1995	293,000	76,104	121.7	69.44
2000	309,466	80,381	122.3	69.44

In developing these estimates of population, the Company reviewed the New Jersey Department of Environmental Protection "Policy" Projections and the Monmouth County Planning Board Projections for each municipality served. In evaluating these projections, the Company also relied on its knowledge of the historical growth patterns of these municipalities and recent experience with housing development throughout its service area. In 1980, the Company served a population of 239,747. This compares with a 1980 census population of 503,173 for Monmouth County as a whole. The 1980 census, for only those municipalities where service is provided, amounted to 283,716. The difference between this figure and the population of 239,747 is due to the fact that some communities (e.g. Holmdel Township, Red Bank) are served only in part by Monmouth Consolidated Water Company. A comparison of the 1980 census population, the Company's population projection for the year 2000, and the DEP and County projections is given in Table 2.

Table 2

Population Projection Comparison

	Population	
Source	Communities Served	County
1980 Census	283,716	503,173
1980 MCWC	239,747	--
2000 MCWC	309,466	---
2000 NJDEP	243,456	588,200
2000 MCPB	340,750	626,600

Projections were made independently for the various customer use categories. Industrial and commercial uses were projected on the basis of historical trends. These two catagories make up small percentages of total system delivery and increases in use have been consistant over the years. It was felt that trend line projections were appropriate for these catagories because of the uniformity of the historical data. Residential uses were projected on the basis of the population estimated and residential per capita use values shown in Table 1.

Residential per capita use is arrived at by dividing the volume used in residential settings by the population served. Historically, the Company has included multifamily dwellings (i.e. condominimums, apartments, etc.) in the commercial use category. These customers have typically represented 33% of the volume used by commercial accounts. For planning purposes, this water was considered to be consumed by residential users and it was added to the volumes reported as residential sales. Commercial uses were projected by trend for the adjusted data for 1973 through 1983. Residential per capita uses were computed for each of these years for the adjusted residential consumption values. For the years prior to 1973, a definate increasing trend in per capita consumption can be seen. However, in more recent years, per capita use has tended to stabilize. The average value for the 1973-1983 period is 69.44 gpcd. This average is expected to hold through the planning period. Considering the size of the existing service area and the fact that new housing is equipped with water efficient plumbing fixtures, no significant increase in residential per capita consumption is anticipated.

Other and non-revenue usage has also been projected through the year 2000. This category includes unaccounted-for water, municipal uses such as street cleaning and sewer flushing, tank maintenance, and sales to institutional customers. As in the case of industrial uses, this has also been stable and a projection was made based on historical use.

The critical period for source planning is based on the "dry-season" average daily use. The "dry-season" corresponds to a recurrence of the 137-day low

flow period which can be anticipated once in twenty years. The calculated safe yield of tne Company's sources is based on such a design drought and it is therefore appropriate to compare this with the average daily "dry-season" demand. This demand is calculated as a rolling four and one-half month average of system delivery. These data were computed for the period of 1974 through 1983 and compared to average day for the year. The four and one half month "dry-season" average day is 1.21 times greater than the annual average day. This factor was used to project "dry-season" demands through the year 2000. A similiar procedure was followed to develop factors for "maximum month average day to annual average day" and "maximum day to annual average day." The projections for the various demand catagories and total average day are presented in Table 3. It is important to note that tne "dry-season" demand has exceeded safe yield in six of the last eight years.

Table 3

Annual Average Daily Demand

Millions Gallons Per Day

Monmouth Consolidated Water Company

Year	Industrial	Commercial	Residential	Other	Total
1985	0.664	5.650	17.914	6.792	31.020
1990	0.709	6.454	19.234	7.043	33.440
1995	0.754	7.259	20.345	7.295	35.653
2000	0.799	8.064	21.488	7.547	37.898

The corresponding estimates for "dry-season" demand, maximum month, and maximum day are shown in Table 4. The Company has recently been approached by Gordon's Corner Water Company regarding the availability of a 2 MGD supply. Monmouth Consolidated Water Company has the ability to provide this base supply and has considered the impact of this additional demand on its source of supply needs. The projected annual average, "dry-season" average day, maximum month average day, and maximum day rates are shown in Table 5. The values are also presented in Figure 1 along with historical use data and the safe yield required to meet these demands.

Table 4

Average Daily Rates

Annual, Dry-Season, Maximum Month, Maximum Day

Million Gallons Per Day

Monmouth Consolidated Water Company

Year	Annual	Dry-Season	Maximum Mo.	Maximum Day
1985	31.020	37.489	41.088	52.734
1990	33.400	40.413	44.290	56.848
1995	35.653	43.088	47.224	60.610
2000	37.898	45.801	50.198	64.427

Table 5

Average Daily Rates

Annual, Dry-Season, Maximum Month, Maximum Dry

Million gallons per day

Monmouth Consolidated Water Company

Plus 2 MGD Supply to

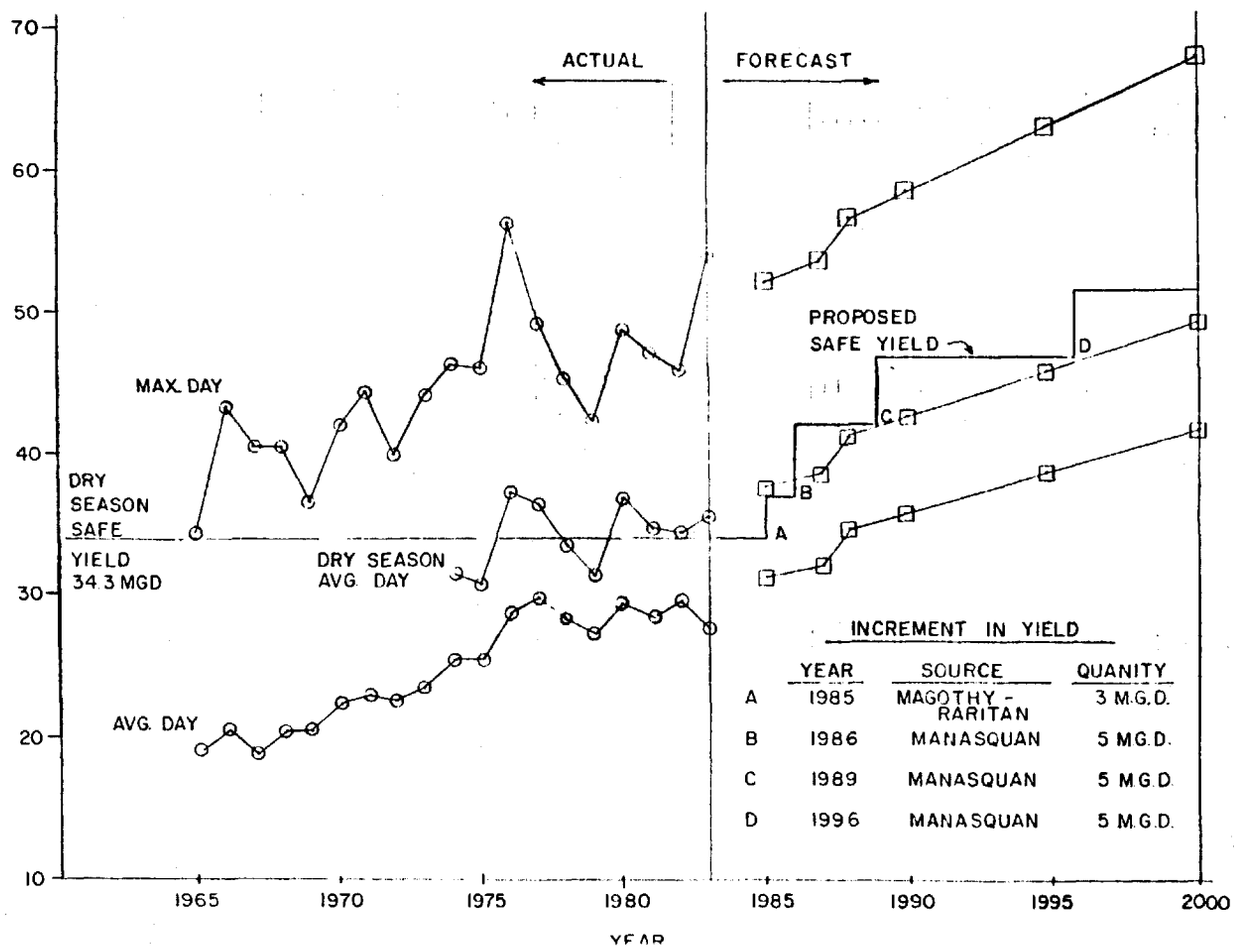
Gordons Corner Water Company

Year	Annual	Dry-Season	Maximum Mo.	Maximum Day
1985	31.020	37.489	41.088	52.734
1990	35.770	42.743	46.620	59.178
1995	38.823	46.258	50.394	63.780
2000	41.928	49.831	54.228	68.457

FIGURE 1

MONMOUTH CONSOLIDATED WATER COMPANY

MAXIMUM DAY, DRY SEASON AVERAGE DAY,
AVERAGE DAY & GROSS VS. TIME



INCREMENT IN YIELD

	YEAR	SOURCE	QUANITY
A	1985	MAGOTHY - RARITAN	3 M.G.D.
B	1986	MANASQUAN	5 M.G.D.
C	1989	MANASQUAN	5 M.G.D.
D	1996	MANASQUAN	5 M.G.D.

E. REGIONAL SOURCE PLANNING NEEDS

Prudent resource management obliges Monmouth Consolidated Water Company to consider source of supply requirements on a regional basis. The company recoginizes the need to develop surface sources to the fullest practical potential so that stresses on critical groundwater areas may be relieved. The accompanying Hydrogeologic Investigation by Perkins-Jordan, Inc. has indentified the critical areas of the Magothy-Raritan and Englishtown formations. Since these areas adjoin Monmouth Consolidated's service area, consideration was given to the feasibility of supplying a portion of the demand in these communities during the planning period.

Three distinct regions have been identified as possible base load service areas. It is the Company's intention in seeking this allocation to consider the production of consistant volumes of water for these regions during the planning period. These three areas are the Bay-shore area, the Freehold Townsnip area, and the Atlantic Coast communities north of the Manasquan River. A summary of the current (1982) demands for these regions is presented in Table 6. Maximum month and winter average uses for 1982 are shown along with projected usage in the year 2000. These data were taken from the "Manasquan Resevoir System Water Demand and Conjunctive Water Use, Interim Report on Population and Water Demand Projections, May 7, 1984" which was prepared by Metcalf and Eddy, Inc. for the New Jersey Water Supply Authority.

The most critical area appears to be the Bay-shore area. A cone of depression has developed in this region and salt water intrusion is becoming a serious threat. Wise regional resource management would suggest that pumping in this region of the Magothy-Raritan formation should be restricted and, if possible, reduced. In its planning, the Company assumes that additional supply needs in this area will be supplied by sources other than the Magothy-Raritan. Surface water from Monmouth Consolidated Water Company could be made available for use in

TABLE 6

Regional Supply Needs

		1982 USAGE (MGD)			2000 USAGE (MGD)		
Region	Municipality	An. Avg.	Max. Mo.	Winter Avg.	An. Avg.	Max. Mo.	Winter Avg.
Bayshore	Matawan/Aberdeen	2.51	3.29	2.36	3.48	4.56	3.19
	Keyport	0.87	0.95	0.82	1.02	1.20	0.95
	Keansburg	1.26	1.56	1.19	1.46	1.90	1.35
	Union Beach	0.73	0.85	0.72	0.87	1.00	0.84
	W. Keansburg W.Co.	3.27	4.58	2.76	4.32	6.09	3.58
	Atlantic Highlands	0.60	0.73	0.56	0.75	0.90	0.71
	Highlands	0.57	0.73	0.53	0.67	0.84	0.61
Freehold	Freehold Borough	1.40	1.50	1.37	1.88	2.16	1.80
	Freehold Township	1.85	2.51	1.60	2.90	4.00	2.42
	Manalapan/Marlboro	4.35	7.36	3.17	6.38	11.23	4.43
Atlantic	Allenhurst	0.14	0.19	0.13	0.16	0.24	0.14
	Avon	0.26	0.40	0.22	0.30	0.47	0.24
	Belmar	0.92	1 41	0.76	1.12	1.72	0.89
	Brielle	0.52	0.73	0.46	0.59	0.88	0.47
	Manasquan	0.70	1.06	0.59	0.72	1.12	0.58
	Sea Girt	0.28	0.42	0.23	0.36	0.58	0.29
	Spring Lake	0.53	0.85	0.41	0.60	1.03	0.44
	Spring Lake Hgts.	0.59	0.79	0.52	0.86	1.16	0.74
	Wall Township	1.54	2.15	1.36	2.83	3.88	2.47
	Red Bank	1.68	1.93	1.62	2.06	2.41	1.97

this area to meet the growth to the year 2000 and to pick up a portion of the existing base demand. The growth in annual average daily demand for the region amounts to 2.76 MGD. In addition to this amount, it is estimated that surface water could be used to supply 33% of the 1982 winter average day, or 2.99 MGD. The total anticipated base demand for the Bay-shore region is estimated at 5.75 MGD in the year 2000. These demand rates are shown for each community in Table 7.

The Freehold region is currently served by groundwater and a growing cone of depression also exists in this area of the Magothy-Raritan formation. This is also shown in the accompanying Hydrogeologic Investigation. Although the Freehold area is some distance from Monmouth Consolidated Water Company's distribution system, it is likely that developer expansion in Colts Neck Townsnip will bring distribution mains to the Freehold Township border. Transmission improvements made to supply Gordon's Corner Water Co. will also facilitate service in this area. Within the planning period, tne Company can anticipate the need to serve the growth projected for the Freehold region. This amounts to 3.55 MGD as an annual average for the year 2000. As in the case of the Bay-shore region, the Company also anticipates the need to supply 33% of the current base load demand for a total of 2.99 MGD by the year 2000. These rates are also identified in Table 7.

The communities of Red Bank, Allenhurst and Avon are areas which could easily be served from Monmouth Consolidated Water Company's system. It is assumed that growth will be supplied by the Company and that regional resource management plans, implemented under the DEP's Water Supply Management Act Rules, will require the Company to provide 33% of the current base load (1982 winter average day) to these communities. This amounts to 0.65 MGD for base load supplies and an additional 0.44 MGD for growth.

Table 7

REGIONAL SERVICE REQUIREMENTS

DEMAND (MGD)

Region	Municipality	1982 Winter Avg. Day	Base Load Requirement	Growth 1982-2000	Total Year 2000
Baysnore	Matawan/Aberdeen	2.36	0.79	0.97	1.76
	Keyport	0.82	0.27	0.15	0.42
	Keansburg	1.19	0.40	0.20	0.60
	Union Beach	0.72	0.24	0.14	0.38
	W. Keansburg Wtr.	2.76	0.92	1.05	1.97
	Atlantic Highlands	0.56	0.19	0.15	0.34
	Highlands	0.53	0.18	0.10	0.28
		8.94	2.99	2.76	5.75
Freehold	Freehold Boro	1.37	0.46	0.48	0.94
	Freehold Twp.	1.60	0.53	1.05	1.58
	Manalapan/ Marlboro	3.17	2.00*	2.03	4.03
		6.14	2.99	3.56	6.55
Atlantic	Allennurst	0.13	0.04	0.02	0.06
	Avon	0.22	0.07	0.04	0.11
	Belmar	0.76	0.25	0.20	0.45
	Brielle	0.46	0.15	0.07	0.22
	Manasquan	0.59	0.20	0.02	0.22
	Sea Girt	0.23	0.08	0.08	0.16
	Spring Lake	0.41	0.14	0.07	0.21
	Spring Lake Hgts.	0.52	0.17	0.27	0.44
	Wall Township	1.36	0.45	1.29	1.74
	Red Bank	1.62	0.54	0.38	0.92
		6.30	2.09	2.44	4.53
TOTAL		21.38	8.07	8.76	16.83

* This value recognizes the recent inquiry by Gordon's Corner Water Company discussed above.

Similarly, the remaining communities in the Atlantic region will account for a baseload of 1.44 MGD. Growth in these areas amounts to 2.00 MGD and it is reasonable to expect that this demand will be met from surface sources. Englishtown wells predominate as the source of supply for these systems and the cone of depression around these wells threatens future reliability.

The total delivery which could be allocated to adjoining areas amounts to 16.83 MGD in the year 2000. It is anticipated that this flow rate will be provided on a year round basis. The existing water systems would continue to maintain their facilities and demands in excess of the base amount would be met by those facilities. This method of conjunctive surface/groundwater use will reduce the current demands on the Magothy-Raritan and Englisntown aquifers and allow some replenisnment to occur.

The average daily flows of Table 4 have have been updated to reflect the regional demand requirements discussed above. These are presented in Table 8 and shown graphically in Figure 2.

TABLE 8

Regional Demand Needs

Average Daily Rates

Million Gallons Per Day

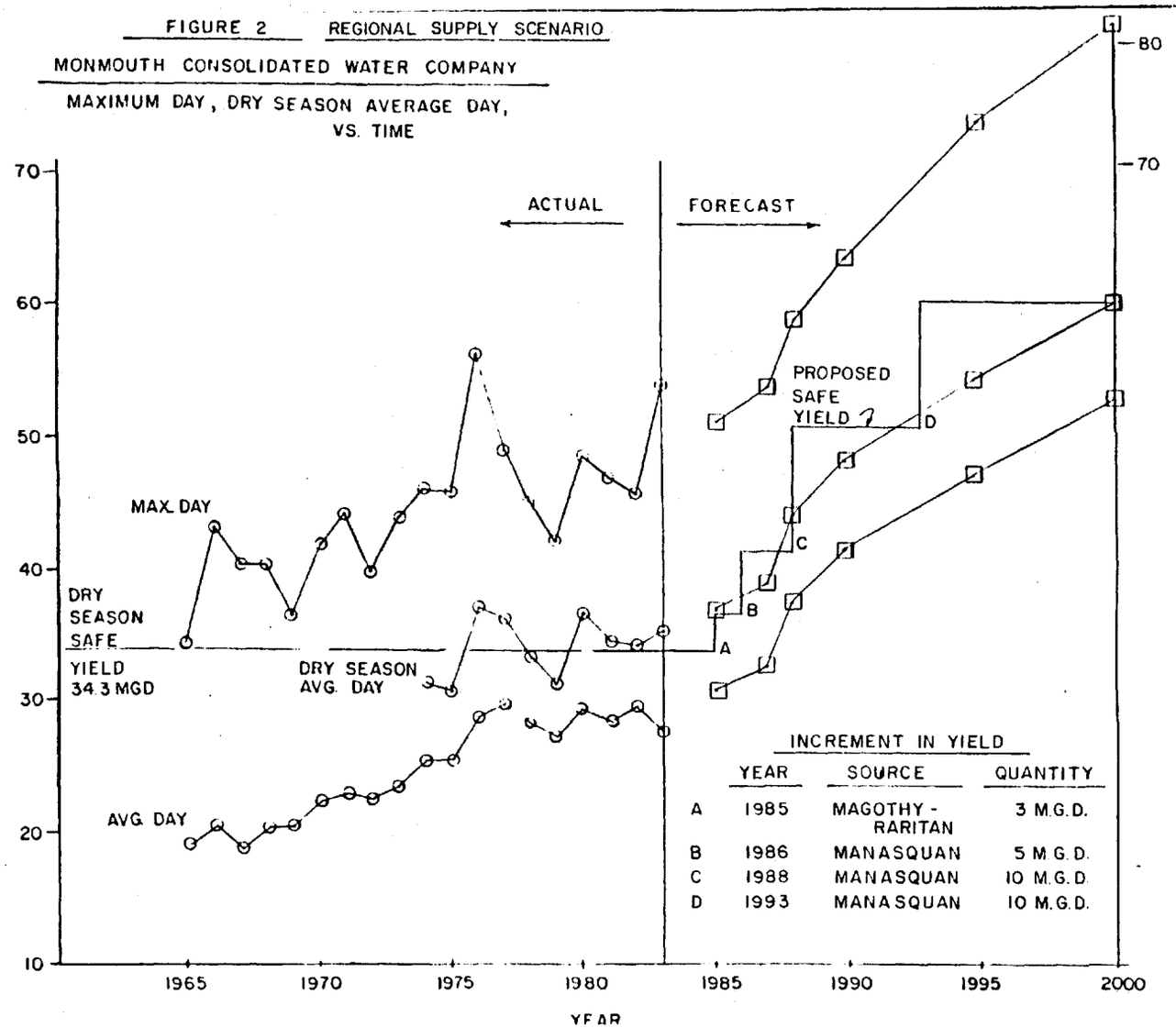
Dry-Season, Maximum Month, Maximum Day

Year	Annual	Dry-Season	Maximum Month	Maximum Day
1985	31.020	37.489	41.088	52.734
1990	42.570	49.543	53.290	65.978
1995	48.613	56.048	60.184	73.570
2000	54.698	62.601	67.028	81.227

FIGURE 2 REGIONAL SUPPLY SCENARIO

MONMOUTH CONSOLIDATED WATER COMPANY

MAXIMUM DAY, DRY SEASON AVERAGE DAY, VS. TIME



INCREMENT IN YIELD

	YEAR	SOURCE	QUANTITY
A	1985	MAGOTHY - RARITAN	3 M.G.D.
B	1986	MANASQUAN	5 M.G.D.
C	1988	MANASQUAN	10 M.G.D.
D	1993	MANASQUAN	10 M.G.D.

F. CONSERVATION

Monmouth Consolidated Water Company has intensified its efforts to locate its unaccounted for water. Our unaccounted-for water for 1983 representated four (4) percent of our system delivery. The Company's efforts at minimizing the level of unaccounted for water have been intensified. In 1983 an electronic leak detection program was instituted, utilizing sonic equipment with computer enhancement. This program employs state-of-the-art technology in the detection and location of distribution leakage and waste.

Customer awareness of the need to use water wisely will be intensely sought over the next several years. In addition, the Company has developed an appropriate price for the water delivered to its customers. Since all accounts are metered, the Company is able to bill each customer for the water they actually use. Even with the proposed increase in groundwater and surface water use, conservation must be employed throughout the system and the region.

G. Proposed Diversion

To meet the increasing demand on the Monmouth Consolidated Water Company System (see Table 5), the company is seeking an increase in permanent diversion in the amount one (1) MGD immediately, two (2) MGD in 1985 and an additional fifteen (15) MGD in five MGD increments in 1986, 1989 and 1996. As shown in Figure 1, this pattern of incremental increases in source of supply will satisfy the projected demand for Monmouth Consolidated Water Company through the year 2000.

The first request for an increased diversion of one (1) MGD is at the Jumping Brook Plant, in Neptune Township, for the existing well number six (6). This would increase the combined allocation from Wells No. 4 and No. 6 from two (2) MGD to three (3) MGD. (Permit No. 5019) No changes in facilities are required since existing pumping capacity is

capable of producing the diversion requested. Perkins-Jordan Inc. has reviewed the feasibility of this diversion and concluded that no significant impact would be felt by surrounding wells. (See Hydrogeologic Investigation which is attached) Wells No. 4 and No. 6 are drilled in the Magothy-Raritan Formation.

The second request for a diversion of two (2) MGD from May 1, to November 15 of each year is for a Magothy-Raritan formation well to be located at the Glendola Reservoir site in Wall Township. This diversion, to be pumped directly into the reservoir after aeration, will receive treatment at the Jumping Brook Plant along with other diverted waters. This source is intended to act as a "peaking" source and to provide additional system reliability during periods of low rainfall. Perkins-Jordan, Inc. has also reviewed the feasibility of this proposed diversion and concluded that no significant impact would be felt by surrounding wells. The closest Magothy-Raritan production wells are Monmouth Consolidated Water Company's own wells at Jumping Brook Treatment Plant. The next closest well is operated by the borough of Avon by the Sea, which is over 2 1/2 miles away.

The total annual Magothy-Raritan allocation proposed (existing plus proposed) amounts to 4.1 MGD (3.0 MGD at wells number 4 and number 6 and 1.1 MGD effective annual withdrawal at proposed Glendola well). This means that as of year-end 1985, when the construction of the new well is complete, ground water will make up 13% of Monmouth Consolidated Water Company's safe yield. Surface water will account for 30.8 MGD or 87% of the safe yield. The percent of ground water used will decrease in 1986 to 11% when the first 5 MGD increment of Manasquan water is available. The percentage will drop to 10% in 1989 and to 9% (less than the current annual percentage) when the final increment of Manasquan water becomes available.

The third request for diversion is a "stepped" request. Monmouth Consolidated Water Company is requesting a total of fifteen (15) MGD from the Manasquan River to be allocated in five (5) MGD increments in 1986, 1989, and 1996. Raw water will be diverted from the Manasquan River and pumped to the Glendola Resevoir through a transmission main

and then treated using conventional surface water treatment, (coagulation, flocculation, sedimentation, and filtration). A temporary intake would be constructed at the Manasquan River, similiar to the company's temporary intake structure at the Jumping Brook Treatment Plant. That structure consists of a well screen installed below the river bed and encased with stone in gabions. The screen is piped to a man hole which houses a submersible pump. The company would utilize this type of temporary structure until such time as the permanant New Jersey Water Supply Authority intake is constructed. The Company anticipates completion of the proposed Manasquan Reservoir System intake pumping system and 100 million gallon off-stream intake reservoirs by or before 1989 when the second 5MGD increment is needed. The temporary intake will be removed from service when these New Jersey Water Supply facilities are on-line and available for use.

Stream flow records for the Manasquan River have been reviewed extensively by the New Jersey Water Supply Authority (Manasquan Reservoir Project, Task 2 - Stream Base Flow & Dependable Yield - Metcalf & Eddy, 1984) and the American Water Works Service Company. These studies concluded that a minimum stream flow of 13 MGD will be exceeded with a reliability greater than 90%. Since this flow is available in nearly all instances, the minimum downstream release of 8 MGD can be guaranteed during the life of the temporary intake. It is the Company's intent to obtain future diversions via New Jersey Water Supply intake facilities. Since these facilities are designed to prevent diversions when minimum passing flows are not available, future diversions will not diminish minimum passing flows. The Squankum gauging station which is upstream approximately two miles will be used to moniter stream flows and assure an 8 MGD passing flow.

H. PROPOSED WELL CONSTRUCTION

The Monmouth Consolidated Water Company is proposing the construction of an additional well at the Glendola Reservoir. This well will be drilled to depth of approximately 1000 feet to the upper portion of the Magothy-Raritan Formation. It is anticipated that a well can be

developed yielding a capacity of at least 2.0 MGD. Water from this well will be aerated and discharged directly to Glendola Reservoir. Final treatment will take place at Jumping Brook Filter Plant.

This well will be constructed in complete accordance with all Department of Environmental Protection requirements. The well drilling procedure will consist of the construction of a pilot hole of at least 8 inches in diameter to the bottom of the upper sands in the Raritan Formation, estimated to be rougnly 1200 feet below grade. The pilot hole will be logged by visual observations of the cuttings as well as by electric logging after drilling. Samples of the sands encountered will be observed and analyzed. Based upon this information, final construction details will then be established. The pilot hole will be increased in diameter by conventional rotary drilling to 22-inches from top of the ground to the top of the sand formation estimated to be 1000 feet below grade. An 18-inch diameter steel casing will be installed in the bore hole and grouted for its entire length. The sand formation will be underreamed beneath this casing to a diameter of 36 inches using the reverse rotary method. A 12-inch stainless steel screen of the appropriate slot size and length will be installed in the underreamed portion and the annulus will be gravel packed. A 12-inch inner steel casing will extend from the top of the screen at least 200 feet to provide transition from the gravel packing and preclude the entrance of sand. A 36-inch square well pump foundation will be constructed at the top of the well and will provide the required seal. This type of well construction will fully protect the aquifer from surface water and vertical transfer from other formations. A deep well turbine pump of the appropriate size will be installed. The discharge head will be provided with openings for the well vent, air line for measuring and recording well levels, and access for physical measurement of water levels. A 1-inch steel sole plate with rubber gasket will be installed to guarantee a proper seal.

I. Conclusions

The additional one (1) MGD diversion from the existing Jumping Brook Well Number Six (6) is needed immediately to decrease the gap between the safe yield and the current dry season average day demand. The additional two (2) MGD diversion requested from the Magothy-Raritan aquifer at the Glendola Reservoir will lessen the impact of the sustained dry season demand until the supply from the Manasquan River is available. The fifteen (15) MGD of raw water from the Manasquan River, made available in five (5) MGD increments, will allow Monmouth Consolidated Water Company to meet the demands of its customers until the year 2000. The Company has carefully considered its own customer's current and future needs as well as outstanding requests for supply from adjoining purveyors. The pattern of supply, treatment, and distribution improvements needed to utilize the proposed diversions is consistent with the growing needs of the Company's franchise area. Unfortunately, the demand for surface water from surrounding systems cannot be stated in firm quantities at this time. An important factor in assessing this demand is the role which will be taken by the New Jersey Department of Environmental Protection in the active management of the region's water resources. If, for example, the Department orders reductions in groundwater withdrawals where significant cones of depression have developed, the likely replacement will be surface water from the Manasquan Reservoir System. Given the geographic relationship of Monmouth Consolidated Water Company to these critical areas, it is probable that the Company will provide the "replacement" surface water from Swimming River, Jumping Brook, Shark River, or the Manasquan River. Until the Department's management policies become clear, the Company will maintain a flexibility in its facility plans to allow additional communities to obtain service from its surface water facilities. One possible regional supply scenario was discussed earlier in this report. (See Regional Source Planning and Figure 2). This diversion will allow the Company to supply water to its own customers and the surrounding communities which have requested an additional source of supply in the next few years. Modifications can, of course, be made to accomodate additional service areas as discussed above.

The recommended regional scheme of conjunctive use of surface and ground water is the method of operation utilized by Monmouth Consolidated Water Company in the past as well as the present. The proposed use of an additional two (2) MGD of Magothy-Raritan water at Glendola Resevoir strictly for dry season demand and drought yield requirements and the proposed diversion of surface water from the Manasquan River meet the intent of the Water Supply Master Plan, and serve the needs of the company's customers.

This application for additional source of supply is considered to be "justified by public necessity" as indicated in this application. The availability of additional goundwater in the locations requested is described in the attached Hydrogeologic Investigation prepared by Perkins Jordan Inc. These diversions will not exceed natural replenishment in the Magothy-Raritan aquifer and will allow adequate minimum passing flows to continue in the Manasquan River.

The Hydrogeologic Investigation report includes exhibits which 1) delineate the other Magothy-Raritan wells within a five (5) mile radius of the requested diversions, 2) list exisiting diversions, 3) show groundwater flow, and 4)show water level observations. This report will justify the availibility of Magothy-Raritan groundwater for diversion in the locations sought.

Early approval of this Diversion Application is essential for Monmouth Consolidated Water Company to provide safe proper and adequate service to its customers in Monmouth County.

Prepared by: James P. Scott, P.E.
Engineer
Monmouth Consolidated Water Company

James P. Scott, P.E.

Reviewed by: Howard J. Woods Jr., P.E.
Director of Engineering
American Water Works Service Company, Inc.
Eastern Division