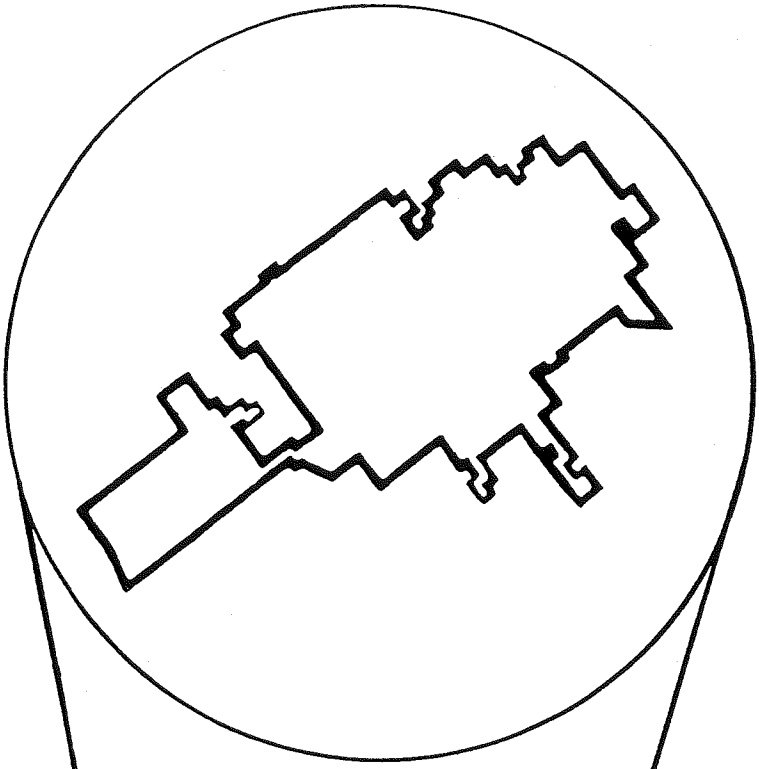
URBAN WATER MANAGEMENT PLAN

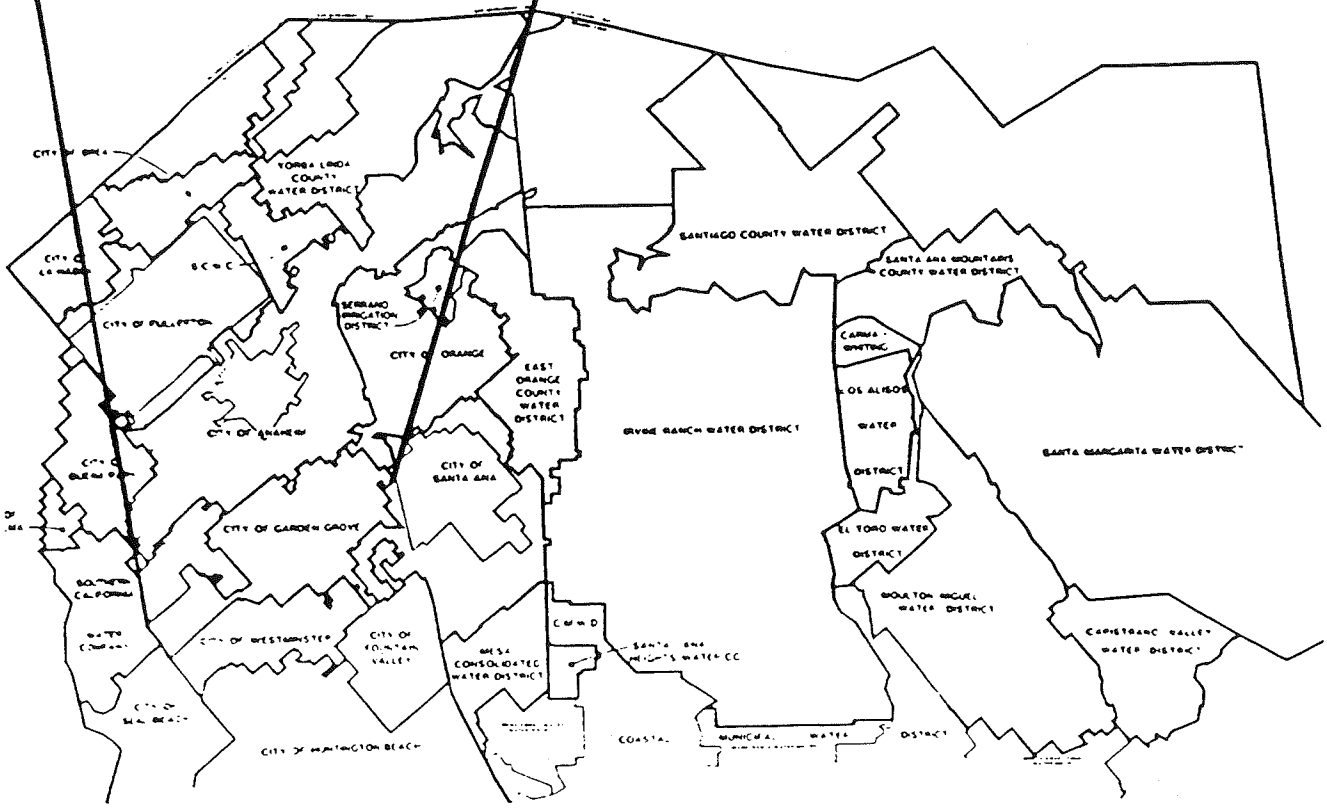
MARCH 1991

CITY OF GARDEN GROVE, CALIFORNIA
11391 ACACIA PARKWAY, P. O. BOX 3070, GARDEN GROVE, CALIFORNIA 92642

CITY of GARDEN GROVE



MWDOC CONTRACTING AGENCIES



THE URBAN WATER MANAGEMENT PLAN

FOR

THE CITY OF GARDEN GROVE

1991

WALT DONOVAN - MAYOR

FRANK KESSLER - MAYOR PRO TEM

ROBERT DINSEN - COUNCILMAN

TILMAN WILLIAMS - COUNCILMAN

MARK LEYES - COUNCILMAN

GEORGE TINDALL - CITY MANAGER

RICHARD CONRAD - PUBLIC SERVICES DIRECTOR

TERRY LANE - WATER SERVICES MANAGER

THE CITY OF GARDEN GROVE

URBAN WATER MANAGEMENT PLAN

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CHAPTER I

INTRODUCTION

This report has been prepared in accordance with the Urban Water Management Planning Act of 1983. The Act requires that "every urban water supplier providing water for municipal purposes to more than 3,000 customers (retail connections) or supplying more than 3,000 acre feet of water annually, prepare and adopt an urban water management plan in 1985 and update that plan by December 31, 1990."

In compliance with the Urban Water Management Planning Act, the City of Garden Grove Water Services Division has prepared the following Urban Water Management Plan. The objectives of this plan are: (1) to provide an estimate on current and projected water use among residential, industrial, commercial, and government; (2) to provide a local perspective on water conservation programs for the City of Garden Grove; (3) to evaluate alternative conservation measures which would improve cost efficiency and environmental impact; (4) to provide a structural framework for the implementation of such a plan; and (5) to describe the frequency and magnitude of supply deficiency in cases of droughts and emergency conditions. This plan complements portions of the water management plans of the Municipal Water District of Orange County, the Metropolitan Water District of Southern California, and the Orange County Water District.

The chapters in this report correspond to the outline of the Act, specifically Article 2, Contents of Plans, Section 10631, 10632, and 10633. However, the sequence used to present the information differs from that of the Act in order to reflect the characteristics of the City of Garden Grove water system.

CHAPTER 2
PAST, CURRENT, AND PROJECTED WATER USE

Section 10631(a) of the Act requires that the plan contain an estimate of past, current, and projected water use. These estimates can be subdivided into the following land categories: residential, commercial and governmental uses. This chapter discusses water development, reviews the factors affecting per capita consumption rates, describes variations in water demand, and summarizes projected water usage in Garden Grove.

WATER DEVELOPMENT IN GARDEN GROVE

The City of Garden Grove established a Municipal Water Department in 1958. By 1966 the department had become the principal water retailer within the City boundaries. At that time, the City's water system was comprised primarily of three components or subsystems known as the "Dyke System," the "City-Owned System,"and the "District System." Together these subsystems served approximately 29,000 customers.

The "Dyke System" was the largest single component with about 12,050 service connections. Originally it was constructed and operated by the Dyke Water Company, a private investor-owned utility. The system was purchased by the City of Garden Grove Water Corporation in 1965, which then leased it to the City. The "Dyke System" acquisition was part of an overall plan to consolidate the various water supply systems in Garden Grove and secure an adequate and reliable water supply for the community.

The "City-Owned System" was comprised of approximately 10,400 accounts served from facilities which, for the most part, had been donated to the City by developers after establishment of the Water Department.

The "District System" was the oldest and smallest portion, serving about 6,000 accounts. It formerly was operated by Orange County Water Works District Number 3. The system was acquired by the City under a lease agreement with the County of Orange in 1960 and has been operated by the City since that time.

In 1976, the City purchased 1,100 service connections within the City's boundaries from the Southern California Water Company. Today there are three remaining private water companies which service about 300 connections. These three companies have requested service from the City's water system and are currently under acquisition.

The major source of supply for all of the above described systems was shallow irrigation wells. Most of the wells had served the community for 10 or more years, during which time production had been increased by several hundred percent. This production increase resulted from increased service demand. The City grew from a population of 41,238 in 1956 to approximately 129,514 in 1985, and 143,050 in 1990.

GARDEN GROVES WATER SYSTEM

The Department of Public Services, Water Services Division, is responsible for maintaining wells, reservoirs, and imported water connections. It also provides on-going maintenance, replacement, and repair to the water delivery system.

Garden Grove maintains a professional staff who monitor and maintain the City's facilities. They are on-call around the clock in the event of an emergency to ensure proper water delivery to the City's thousands of commercial, residential, and industrial users.

With a population of over 143,050, the water demand currently exceeds 9.6 billion gallons a year. Garden Grove has twelve wells located around the City (two wells under construction), with a pumping capacity of over 29,635 gallons per minute. Its multiuse reservoirs have a total storage capacity of 45 million gallons, enough emergency storage for 1.8 days. In addition, four import water connections have the capability to import up to 22,000 gallons per minute. Table 1 displays the specific features of Garden Grove's water system.

COUNTY AGENCIES

In 1933, the Orange County Water District (OCWD) was formed by a special act of the state legislature. Its primary responsibilities are the management of Orange County's groundwater basin and protection of the County's rights to water in the Santa Ana River. The City of Garden Grove pumps approximately 70 percent of its water from the groundwater supply. (Refer to OCWD's plan for additional information regarding OCWD's current and future water conservation activities.)

In 1951, the Municipal Water District of Orange County (MWDOC) was formed to supply supplemental water to many water purveyors within Orange County. MWDOC purchases the water from Metropolitan Water District of Southern California (MWD), which it then resells to the City. Garden Grove imports approximately 30 percent of its water from MWDOC.

In Garden Grove, a blending system has been installed at a well that was constructed by Orange County Water District (OCWD) for the remediation of excessive nitrates. The original intent of this project was to use a desalting facility for wellhead treatment due to the high amounts of nitrate in the water. The new well produced twice the volume of water than what had been anticipated with a lower concentration of nitrate; however, the nitrate content was higher than the permissible level for drinking water. OCWD and the City then decided it would be more economical to blend this water with lower-nitrate supplies from another nearby City well to achieve the desired quality. About 3,500 gallons per minute will be pumped from the well and this water, containing 57 mg/l nitrate, will be blended with high-quality groundwater to meet the regulatory standard of 45 mg/l or less. The waters will be mixed in an existing City reservoir, where the resultant blend will be continuously monitored by a nitrate analyzer.

Although this 1.6 million dollar project carries a greater capital cost than a desalting system would have, it will produce significantly more water per dollar invested. The additional project cost is due to the increased water production. As a result of the large volume of water pumped, 900 feet of 30 inch discharge pipeline and 1,000 feet of 36 inch overflow pipeline were required. A larger electrical power supply had to be provided, as well as a booster pump and building modifications. The blending project is expected to cost about $120 per acre-foot, not including the basin equity assessment. The 4,500 acre-feet per year produced by the well will replace an equal amount of imported water, cutting the City's imported water demand in half.

WATER DEMAND

Water demand is affected by population densities, climatic factors and temporal variations based on the characteristic behavior of the public. The average daily per capita demand is a useful criteria for evaluating the historic water demands of an area, as well as projecting future water demands in conjunction with population and planning area projections. The per capita consumption figure represents the overall average water use pertaining to residential, industrial, public and commercial demands, as well as any losses within the water distribution system.

Historically, per capita consumption rates in developed areas tend to increase at a low annual growth rate. Table 2 lists the annual usage of domestic water within Garden Grove from 1977 to 1990. Table 2 also displays the annual per capita consumption rate during the same period. The overall per capita consumption rate was near 158 gallons per capita demand during 1977-78 and increased to approximately 197 gpcd by 1989-90. Table 3 lists the annual usage of domestic water within Orange County from 1976 to 1989 and shows the annual per capita consumption and rainfall during the same period. As shown, the overall per capita consumption was approximately 202 gpcd in the late 1970's and has risen to approximately 242 gpcd in the late 1980's.

Figure 1 illustrates residential water demands which account for roughly 88.5 percent of the water use in Garden Grove. The remaining 11.5 percent is for commercial/industrial (7 percent) and municipal/unmetered use (4.5 percent). Within the residential sector, approximately 58 percent of the water demand is for interior use with the remaining 42 percent used for landscape irrigation and other outside uses. Figure 2 illustrates the distribution of residential water use. Major water use areas in the home include the toilet (24 percent), bath (19 percent), laundry (8 percent), kitchen (5 percent), and cooking (2 percent).

Projected population growth in both Orange County and Garden Grove is highlighted in Table 4. The population of Orange County in the year 2000 is estimated to be over 2,599,200. The population estimates for the City of Garden Grove for the same year amounts to 151,762. Figure 3 provides data which refers to the City's historic and projected uses through the year 2000. Estimates project total water usage to be 33,491 acre feet by the end of the century.

Orange County is heavily dependent upon imported water and has in the last decade, imported approximately 60 percent of its total demands. MWD provides wholesale water to Southern California; it imports water from the Colorado River Aqueduct and distributes State Water Project (SWP) water within its service area.

California's water is a valuable and limited natural resource. There is a continuing need to conserve and efficiently utilize existing water supplies. Interest in water conservation has been heightened by the continual growing need for water throughout California. The growth in water demands will continue due to the projected increase in population, along with an increase in commercial and industrial activity. Water conservation and management will help to meet those growing needs.

In 1985, it appeared that without additional water supplies, a water shortage of considerable magnitude would occur before 1995. Since 1986, California has experienced five consecutive critically dry years and rationing seems unavoidable.

TABLE 1

GARDEN GROVE WATER SYSTEM
STATUS
15 JAN 1991

WATER USE

AVERAGE DAILY USE	25 MILLION GALLONS
MAXIMUM DAILY USE	40 MILLION GALLONS
AVERAGE FLOW DEMAND	17,933 GALLONS PER MIN
MAXIMUM FLOW DEMAND	27,500 GALLONS PER MIN
TOTAL YEARLY USE	9.6 BILLION GALLONS

RESERVOIRS

NUMBER	7 TANKS
WATER STORAGE CAPACITY	45 MILLION GALLONS
BOOSTER PUMPS	16 PUMPS
BOOSTER CAPACITY	35,650 GALLONS PER MIN

WELLS

NUMBER	12 WELLS
PUMPING CAPACITY	29,635 GALLONS PER MIN
2 NEW WATER WELLS UNDER CONSTRUCTION	#26 AND #27

IMPORT CONNECTION

NUMBER	4 CONNECTIONS
IMPORT CAPACITY	22,500 GALLONS PER MIN

DISTRIBUTION FACILITES

WATER MAINS	360 MILES
FIRE HYDRANTS	3,318 HYDRANTS
SERVICE CONNECTIONS	33,110 SERVICES

TABLE 2

GARDEN GROVE HISTORIC DOMESTIC WATER DEMAND
PER CAPITA WATER CONSUMPTION SUMMARY

YEAR	USAGE (A/F)	POPULATION	GPCD
77-78	21,053	118,200	158
78-79	23,769	118,700	179
79-80	24,681	122,900	179
80-81	27,276	123,307	185
81-82	26,176	126,019	185
82-83	24,418	127,580	174
83-84	28,092	129,514	194
84-85	28,709	130,319	194
85-86	28,736	131,315	195
86-87	29,401	132,315	198
87-88	29,460	133,313	197
88-89	29,462	134,311	196
89-90	29,860	135,286	197

Source: City of Garden Grove Water Services Division, Fiscal year's accounting.

GPCD = Gallons per capita per day

TABLE 3

TOTAL ORANGE COUNTY HISTORIC DOMESTIC WATER DEMAND
PER CAPITA WATER CONSUMPTION SUMMARY

Year	Usage (A-F)	Estimated Population	GPCD	Rainfall (Inches)
1976-77	417,900	1,768,000	210	10.4
1977-78	389,100	1,815,000	191	28.5
1978-79	420,200	1,855,000	202	18.5
1979-80	449,601	1,921,000	209	21.2
1980-81	525,644	1,972,700	238	8.8
1981-82	458,645	2,002,000	205	13.1
1982-83	469,693	2,036,000	206	26.9
1983-84	555,501	2,066,000	240	9.1
1984-85	538,971	2,119,509	227	11.3
1985-86	539,224	2,166,562	227	16.3
1986-87	568,416	2,217,476	229	6.6
1987-88	566,222	2,266,300	223	11.1
1988-89	615,134	2,273,350	242	7.5

SOURCES:

Orange County water use from Metropolitan Water District of Southern California annual reports. Orange County population from Orange County Progress Reports.

TABLE 4

HISTORIC AND PROJECTED POPULATIONS FOR
CITY OF GARDEN GROVE SERVICE AREA AND TOTAL ORANGE COUNTY

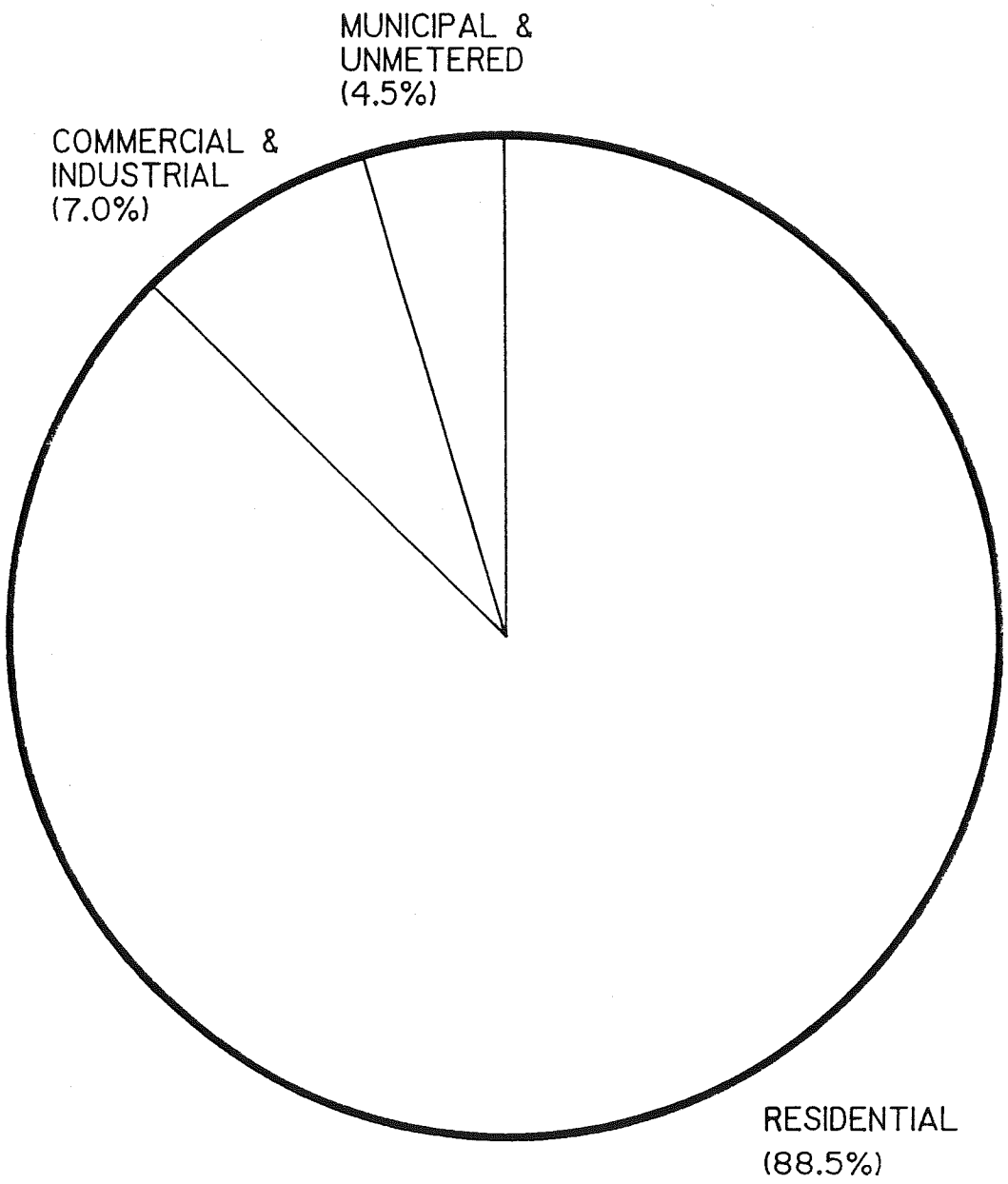
YEAR	GARDEN GROVE	ORANGE COUNTY
1985	130,319	2,088,350
1990	143,050	2,410,556
1995*	147,342	2,488,800
2000*	151,762	2,599,200

SOURCE: BUREAU OF THE CENSUS DEPARTMENT OF COMMERCE, 1990.

* PROJECTIONS AT 3 PERCENT GROWTH FACTOR.

FIGURE 1

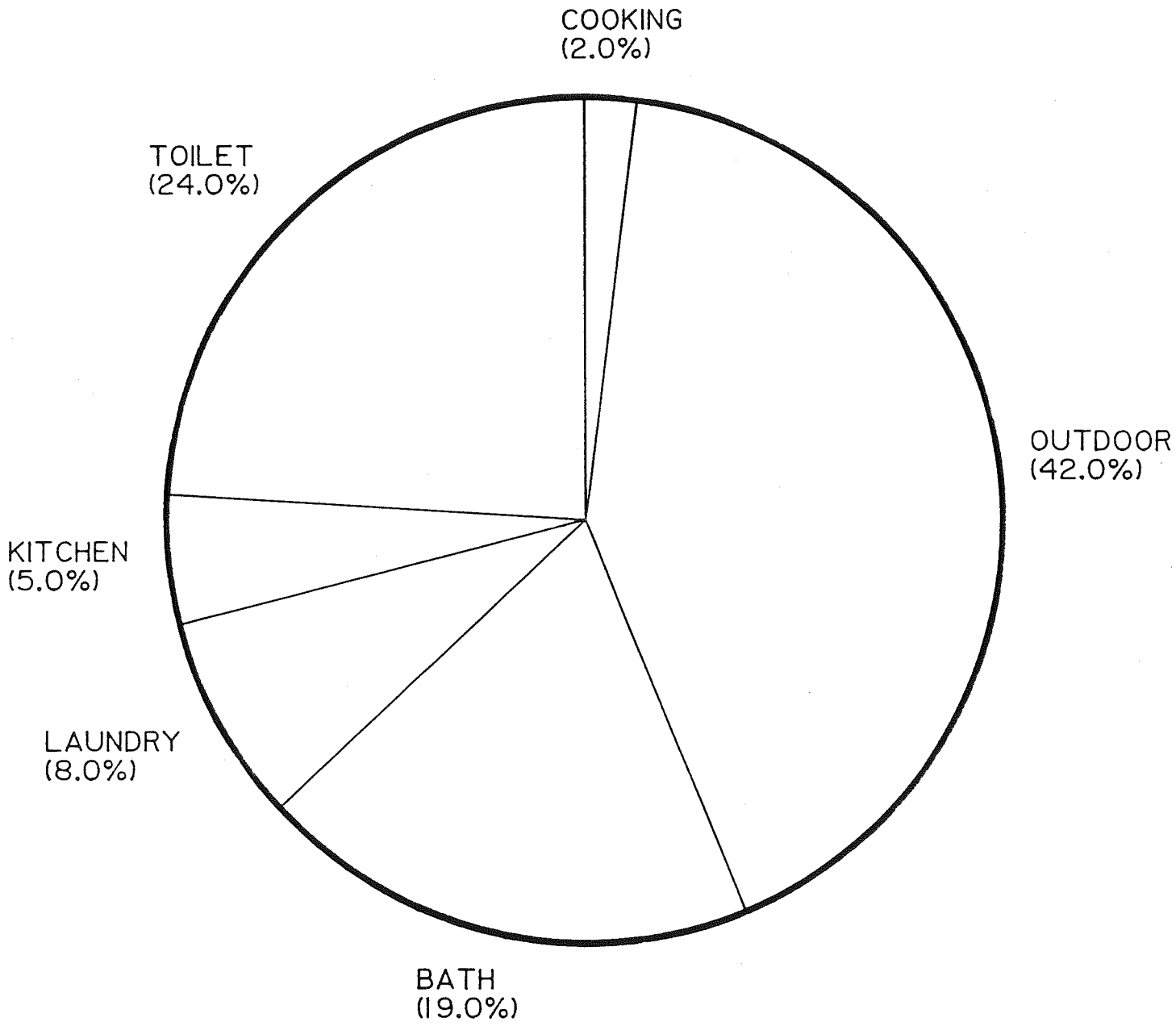
WATER USAGE IN GARDEN GROVE



SOURCE: CITY OF GARDEN GROVE - WATER SERVICES, 1990.

FIGURE 2

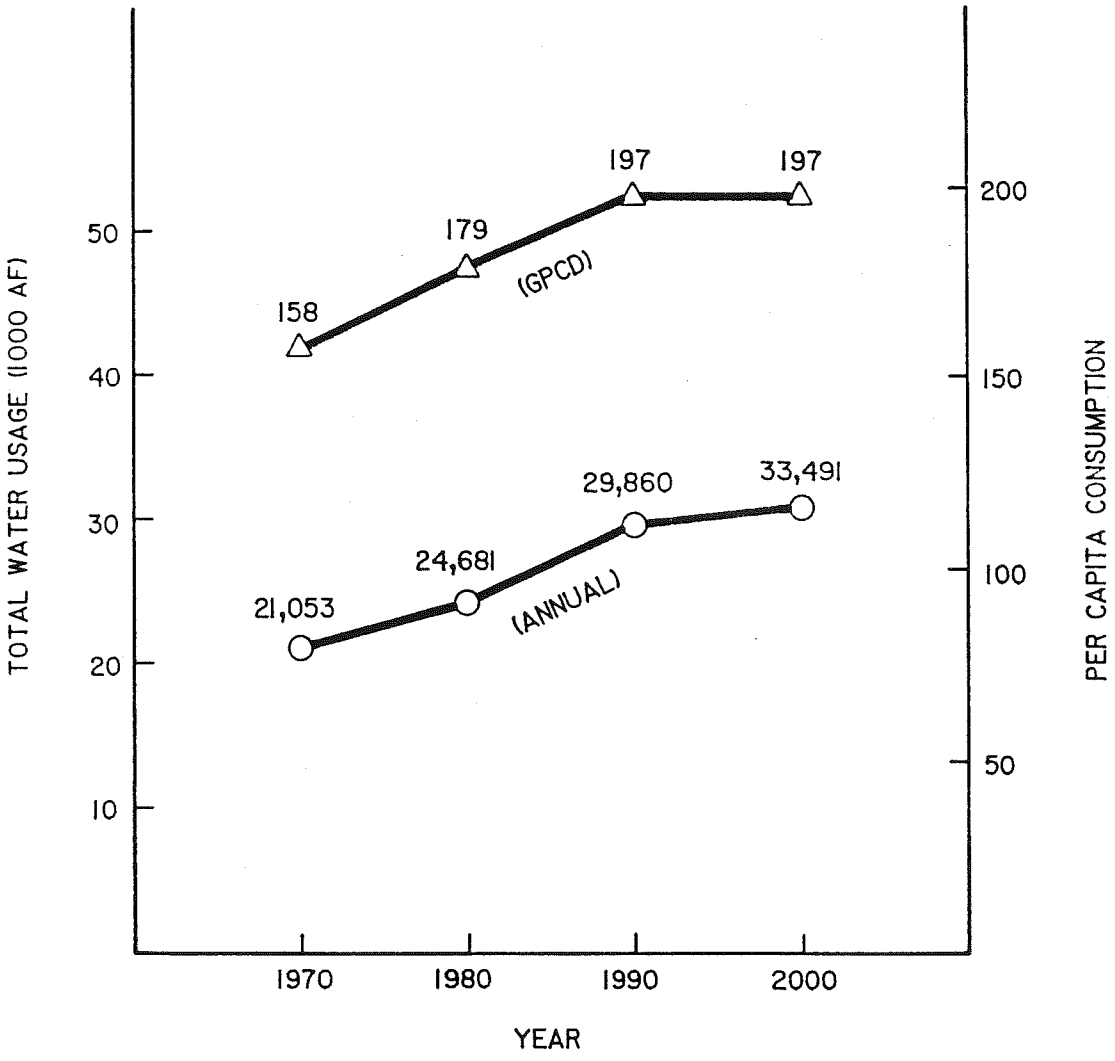
RESIDENTIAL WATER USAGE IN ORANGE COUNTY



SOURCE: ORANGE COUNTY

FIGURE 3

CITY OF GARDEN GROVE HISTORIC AND PROJECTED WATER USAGE



LEGEND:

△ = PER CAPITA CONSUMPTION

○ = ANNUAL ACRE FEET

SOURCE CITY OF GARDEN GROVE - WATER SERVICES, 1990.

CHAPTER 3

WATER SUPPLY DEFICIENCIES AND RESPONSE

Section 10631(e) of the Act requires that the plan include a description of the frequency and magnitude of supply deficiencies, including conditions of drought and emergency, and the ability to meet short-term deficiencies. Water supply deficiencies and response have been brought into focus by MWDOC's Urban Water Management Plan. For detail analysis, refer to MWDOC's Urban Water Management Plan.

The City's Water Conservation Task Force has drafted a Water Conservation Program Ordinance. This proposed Ordinance consists of stages of Water Conservation (exhibit A). The following matrix illustrates measures that Garden Grove will take (with City Council approval) to reduce demand during short term and/or extended drought deficiency periods:

PROPOSED WATER CONSERVATION PROGRAM

Conservation Measure	Stage 1*	2	3	4
Lawn-Watering and Landscape Irrigation				
- Every other day unless a hand-held hose, hand-held bucket, or drip irrigation system is used.	X			
- "Designated irrigation days" (every other day) between 6 p.m. and 10 a.m. the following day unless hand-held hose, hand-held bucket, or drip irrigation system is used.		X		
- "Designated irrigation days" (every 3 to 4 days) between 6 p.m. and 6 a.m. the following day.			X	
- Outdoor irrigation of vegetation is prohibited.				X
Agricultural Users and Commercial Nurseries				
- Required to curtail all non-essential water use. Watering of livestock and irrigation of propagation beds permitted at any time.		X		
- Use of water limited to the hours of 6 p.m. and 6 a.m. the following day. Watering of livestock and irrigation of propagation beds permitted at any time.			X	
- Use of water for other than livestock watering is prohibited.				X
Washing of Autos, Trucks, Boats, Mobile Equipment, Etc.				
- Every other day unless done at a commercial car wash.	X			
- "Designated irrigation days" (every other day) between 6 p.m. and 6 a.m. the following day, unless done at a commercial car wash.		X		
- Prohibited except at a commercial car wash.			X	
- Prohibited, except for reasons of public health, safety and welfare (i.e., garbage trucks, food-delivery vehicles).				X
- Commercial car washes not using partially reclaimed or recycled water to reduce usage volume by 20 percent.			X	

*Voluntary conservation measures only.

Conservation Measure	Stage 1*	2	3	4
Filling or Refilling of Swimming Pools, Spas, Ponds, etc.				
- Once every other day.	X			
- "Designated irrigation days" (every other day) between 6 p.m. and 6 a.m. the following day.		X		
- "Designated irrigation days" (every 3 to 4 days) between 10 p.m. and 6 a.m. the following day.			X	
- Prohibited.				X
Golf Courses, Parks, Schools, Grounds, Recreational Fields				
- Watering between 4 p.m. and 10 a.m. the following morning. Watering of golf greens permitted at any time.	X	X		
- Watering between 6 p.m. and 6 a.m. the following morning. Golf green watering at any time.			X	
- Watering prohibited, except for plant materials classified as being rare, exceptionally valuable, or essential to the well-being of rare or endangered animals.				X
Sidewalks, Driveways, Parking Areas, Tennis Courts, Patios, or Other Paved Areas				
- Water should not be used to wash down such surfaces.	X			
- Watering to wash down such surfaces is prohibited, except to alleviate immediate fire or sanitation hazards.		X	X	X
Restaurants				
- Should avoid serving water to customers unless specifically requested.	X			
- May not serve water to customers unless specifically requested.		X	X	X

*Voluntary conservation measures only.

Conservation Measure	Stage 1*	2	3	4
Ornamental Fountains, Similar Structures				
- Should not be operated.	X			
- Operation is prohibited.		X	X	X
Fire Hydrants				
- Use limited to fire fighting, system testing; construction activities; other activities necessary to maintain the public health, safety, and welfare.	X	X	X	X
Other Provisions				
- Use of water-softening devices is prohibited.			X	X
- Water leaks (major leaks) to be repaired immediately.			X	X
- New construction meters or permits for unmetered service shall not be issued.			X	X
- No water is to be used for air conditioning purposes (i.e., swamp cooling).				X

*Voluntary conservation measures only.

CHAPTER 4

CURRENT WATER CONSERVATION PROGRAMS

Section 10631(b) of the Act requires identification of conservation measures that have been adopted and implemented. Current water conservation measures by MWD and MWDOC are illustrated in their respective Urban Water Management plans. This chapter summarizes the current water conservation measures being taken by the City of Garden Grove.

The City's conservation measures are outlined in Table 5. Such measures include public information through cable television and information brochures. The City has established a Water Conservation Task Force to review and implement various conservation guidelines. This committee has drafted a proposed Water Conservation Ordinance which is undergoing review by appropriate hearing bodies at this time.

The City's Water Division and Parks Division have formed a committee to review and implement water conservation techniques on City parks and medians.

Microprocessors to control reservoirs are being used by the City to improve efficiency (limiting pressure peaks) thus reducing water usage. Meter replacement and testing programs have also been effective in reducing water usage. Prior to the implementation of the meter replacement and testing program in 1980, the City was realizing an 18 percent water loss as a result of malfunctioning water meters. Currently the unmetered water loss is slightly more than 4 percent.

The City of Garden Grove Water Services Division has historically experienced problems with nitrate contaminated groundwater resulting in the closure of an estimated 40 municipal wells. Although the City has been able to meet demand through drilling deeper wells, the nitrate problem has limited the use of groundwater production capabilities.

In an effort to have less dependence on imported water, to restore the polluted aquifers and to prevent the contamination of the lower aquifer, the City entered into an agreement with the Orange County Water District (OCWD) in November of 1989. As mentioned in Chapter 1, this nitrate blending project will yield the City an additional 4,500 acre feet per year.

TABLE 5
CITY OF GARDEN GROVE
CURRENT WATER CONSERVATION MEASURES

I. Public Information	
A. Cable Television	Messages regarding water conservation are displayed by means of Paragon Cable, a cable TV company that serves the Garden Grove area.
B. Informational brochures	The City of Garden Grove mails and displays informational brochures on water conservation.
II. Water Conservation Task Force	The City has formed a Water Conservation Task Force and related committees to review and implement various conservation guidelines and measures.
III. Development Policies	One department has implemented new construction policies to include requirements for water conservation measures.
IV. Microprocessor Controlled Reservoirs & Pumping Stations	The Production Section of the Water Services Division is in the process of installing microprocessors at a third site. This will enable the division to supervise the system, utilizing such features as automatic pressure reductions at peak demand periods, (reducing water usage), trending, and future telemetry of the entire system, which will enable operations to automatically control pressures on a systems level.
V. Meter Replacement Program	Because of inefficient water meters, the City was realizing an 18 percent water loss. The City started a meter replacement program. Currently, unmetered water is at 3.8 percent which includes water for fire, street sweeping and parks.
VI. Water Bill Newsletter	The Water Bill Newsletter is a bi-publication which contains community news and water tips.

VII. News Releases	Garden Grove has access for water conservation news in several local newspapers which include the Orange County News , the Anaheim Bulletin , the Long Beach Independent , and the Los Angeles Times .
VIII. Public Service Announcements	Radio Station KWIZ provides air time for public service announcements which may run for a 60-day period. The Water Services Division has access to this media.
IX. Freeway Auto Center Sign	An electronic message board is located in Garden Grove's auto mall, highly visible from the Garden Grove (22) freeway, which furnishes ten-second messages to the public on obtaining water conservation kits and conservation tips.
X. Water Quality Report	This annual report is distributed to City residents and provides the public with a detailed assessment of the type and quantity of the constituents in the water.
XI. Leak Detection	Garden Grove staff is currently researching the various leak detection devices, and is preparing procedures to implement a formal leak detection program in 1991.
XII. Water Plan Implementation	Water Plan is a useful software package which provides the division with information regarding the feasibility, cost, labor requirements, and estimated completion times to implement the various water conservation measures available to the industry.
XIII. Microprocessor Controlled Reservoirs & Pumping Stations	Microprocessor based controls are being phased into the pump stations throughout the City. These new controls will provide the necessary capabilities for the Water Division to better control the pressure, level, and flows resulting in reduced production in off-peak hours.

CHAPTER 5
ALTERNATIVE WATER CONSERVATION MEASURE

This chapter contains information required by two parts of Section 10631 of the Act. The first part requires a description of the alternative conservation measures that could improve the efficiency of water use, along with an evaluation of their significant impacts. The second part requires a schedule of implementation for the proposed alternative conservation measures.

Alternative Levels of Conservation

As discussed in Chapter 4, the City of Garden Grove has developed a number of methods and technologies that, over the course of time, will become successful water conservation programs.

As discussed in Chapter 3, the Water Conservation Task Force has drafted a Proposed Water Conservation Program and Ordinance (Exhibit A). It is currently pending City Council approval.

The following are alternative levels of conservation measures scheduled for review by the Water Conservation Task Force (Source: Water Plan, Version 1.0, State of California Department of Water Resources):

- Minimal Kit Delivery Program
- Information and Education, Residential
- Public Information Program, Commercial
- Residential Water Audit
- System Water Audit, Leak Detection and Repair
- Toilet Replacement Program
- Lawn Watering Guides
- Large Turf Irrigation Audits
- Xeriscaping, New Residential/Commercial

Minimal Kit Delivery Program

The minimum kit delivery program involves providing high-efficiency shower heads, toilet dams or displacement devices, faucet aerators, and other water conservation materials as deemed feasible and cost-effective.

Summary: Benefit/Cost Ratio - 1.5
Total Cost - $500 per year
Payback period - 1.2 years

Information and Education, Residential

Water conservation information campaigns increase customers' awareness of habits or procedures which waste water, as well as their awareness of water scarcity, available water sources, system capacity, and treatment and distribution issues. Public information campaigns are designed to promote understanding and dialogue in the community on water conservation topics, as well as to motivate customers to conserve water.

Summary: Benefit/Cost Ratio - 1.9 years
Total Cost - $16,241 per year
Payback Period - 1 year

Public Information Program, Commercial

The California Department of Water Resources has developed a program to identify effective commercial and industrial water conservation measures. This information is available to municipal water agencies who can in turn, share it with their large water use customers. Hopefully, these commercial and industrial customers can then involve their employees in water conservation efforts to achieve water savings.

Summary: Benefit/cost ratio - 1.8
Total Cost - $12,000 per year
Payback period - 1 year

Definition of terms:

- The benefit/cost ratio is the ratio of the present value of benefits to the present value of costs.

- Total cost is the total cost per year for each program.

- Payback is the number of years required to recover the initial investment. Water agencies payback is identified as reduced dependence on imported water.

Residential Water Audit

A residential water audit is conducted by a Water Services Division representative at the request of the homeowner. The specific design of an audit may vary but generally consists of four components. First, water uses are identified and discussed with the homeowner. Second, an offer is made to install low-flow showerheads, tank displacement dams, and faucet aerators, and to use leak detection tablets on the toilets. Third, toilet leaks, if identified, are repaired. Finally, information on further actions that can be taken to conserve water, including a lawn watering guide, are provided.

Summary: Benefit/cost ratio - 1.2
Total Cost - $3,500 per year
Payback Period - 4.5 years

System Water Audit, Leak Detection and Repair

A distribution system water audit compares the amount of water produced by the agency (from wells, surface supplies, and interagency ties) to the amount of water used by customers (as reported by meter readings). The difference is unmetered water. After allowing for authorized unmetered uses such as fire fighting, main flushing, and public use, it can be assumed that the remaining unmetered water is due to inaccurate water readings, malfunctioning valves, leakage, and theft. Water audits should be done at least once a year.

Summary: Benefit/cost ratio - 17.0
Total Cost - $1 million per year
Payback Period - 11 years

Toilet Replacement w/ultra low flush

Ultra-low-flush toilets use special designs to reduce water used for toilet flushing to about 1.5 gallons per flush. This is significantly less than the 5.5 gallons per flush used in a non-conserving toilet and the 3.5 gallons per flush used in a low-flush toilet. Two main types of ultra-low-flush toilets are currently available. The first type retains the gravity flush concept, operating very efficiently because of improvements in design. Toilets with this design typically use 1.0 to 1.5 gallons per flush. A second category eliminates the gravity flush concept. One model of this type features a pressurized flush tank, in which water is forced into the bowl using pressure from the water system.

Summary: Benefit/cost Ratio - .4
Total Cost - $16,000 per year
Payback Period - 56.0 years

Lawn Watering Guides - Existing Residential

Lawn watering guides are designed to help residents identify and correct problems with an irrigation system and to develop precise irrigation schedules.

Summary: Benefit/cost ratio - 1.4
Total Cost - $1500 per year
Payback Period - 1.9 years

Large Turf Irrigation Audits

An irrigation audit involves water agency representatives or consultants who perform an on-site audit of multi-site irrigation systems and produce customized irrigation schedules for each site. The objective is to provide landscape managers with information to enable them to do timely equipment maintenance and to apply accurate irrigation amounts throughout the year based on explicit customized reports. During the audit process, brochures describing the causes and cures of maintenance and management problems in large turf irrigation systems should be included with the agency's irrigation guide. This program could be directed towards school districts, parks, medians, etc.

Summary: Benefit Cost Ratio - 1.3
Total Cost - $900 per year
Payback Period - 1.8 years

Xeriscaping

Many building owners and landscape managers of residential and commercial properties are not familiar with low turf area landscapes using California's indigenous plants and other low water plants. A demonstration garden shows that xeriscaping can be both attractive and functional.

Seven xeriscape principles have been established :

- Good landscape planning and design.
- Limit size of turf areas.
- Use of low water using plants to reduce transpiration.
- Efficient irrigation systems and scheduling.
- Soil improvement where necessary.
- Use of mulches to reduce evaporation from the soil.
- Appropriate maintenance.

Of these seven, the limiting of turf areas is the most useful in reducing landscape water use. Additionally, plants adapted to the dry and hot conditions of California require much less water than the familiar landscape ornamental plants imported from the east coast of the United States and Europe.

Summary: Benefit/cost ratio - 0.1
Total Cost - $500,000 per year
Payback Period - 218 years

Implementation Schedule

The Water Conservation Task Force will be studying the alternative water conservation programs during the next year. It is anticipated that prior to implementation, many of the alternative water conservation programs will be prioritized, reviewed and submitted to the City Council for approval. Once this process has been completed, a detailed implementation schedule identifying dates for each program can be developed and made part of the City of Garden Grove's Water Conservation Plan.

CHAPTER 6
WASTEWATER RECLAMATION

Section 10632(a) of the Act requires urban water suppliers to evaluate the potential for producing additional water supplies from wastewater reclamation activities.

Water reclamation has become an integral part in the state's water supply equation. For example, reclaimed water use in MWD's service area now exceeds 200,000 acre-feet per year, amounting to approximately 5 percent of total demand.

Existing reuse practices can be grouped into the following six major categories: agricultural irrigation, landscape irrigation, industrial use, groundwater recharge, recreational and landscape impoundments, and fish and wildlife habitat enhancement.

Orange County Water District manages an ongoing reclaimed water project (Green Acres), which distributes reclaimed water to various coastal water agencies in Orange County. The District has recently retained a consultant to study the feasibility of delivering reclaimed water to central County cities to include Garden Grove.

The largest use of reclaimed water in Orange County is groundwater recharge, followed by agricultural and landscape irrigation. For additional information regarding water reclamation projects, please

CHAPTER 7
EXCHANGE AND TRANSFERS OF WATER

Section 10632(b) of the Act requires urban water suppliers to explain and evaluate their plans for future exchanges or transfers of water within Orange County.

Intercounty Transfers

In general, Southern California has been creative in its usage of water transfers and exchanges, with much of its supply coming from hundreds of miles away. Details of these major transfers and of the innovative water exchanges, either agreed to or under active negotiation, are included in MWD's Urban Water Management Plan.

Intracounty Transfers

Water exchanges and transfers within Orange County are used to solve problems concerning distribution systems and to assist in short-term emergency situations. In order to determine whether sufficient transmission capacity exists to meet local needs, the MWDOC annually tabulates the projected demand by agencies five years into the future. Regional planning for interconnections between separate water agencies over the past 12 years has played a key role in the development of both local and regional projects.

Intercity Transfers

The City of Garden Grove has nine emergency connections with other cities to assist in short-term emergency situations such as main breaks, fires, etc. These emergency connections, listed below, provide sufficient sources of emergency water supplies to meet the City's needs, as well as the needs of adjacent agencies.

CITY	LOCATION	SIZE
*Stanton	Court & Garden Grove	1400 gpm
Westminster	Magnolia & Westminster	3600 gpm
Anaheim	Katella & Palmwood	1500 gpm
Anaheim	Katella & Dino Cir	1500 gpm
Anaheim	Euclid & Orangewood	1600 gpm
Anaheim	Haster & Simmons	900 gpm
Orange	End of Simmons	900 gpm
Orange	End of Sirius	900 gpm
Santa Ana	Fairview & Huckleberry	900 gpm

* Southern California Water Company

CHAPTER 8
MANAGEMENT OF SYSTEM PRESSURE AND PEAK DEMANDS

Section 10632(c) of the Act requires an evaluation of the management of water system pressures and peak demands by urban water suppliers. This chapter addresses two aspects of water system management--system pressure and peak demand management. In looking at these concepts, it is important to keep in mind that a reduction in distribution system pressure will, to a certain degree, conserve water by reducing leaking in water and plumbing systems as well as reducing wastage of water when water fixtures are turned on and off. Energy can also be conserved by water conservation and by reducing pumping, which may be necessary to achieve system pressure. In addition, a reduction in peak demands can reduce the need for construction of new water storage and conveyance facilities and, in certain instances, the development of new water sources.

SYSTEM PRESSURE MANAGEMENT

MWD's pressure peak demand management is described in detail within its Urban Water Management Plan. The City of Garden Grove manages system pressure by reducing pressure at night throughout the distribution system. In an emergency the City can lower its pressure to a minimum and still meet fire protection requirements. This option was utilized during the 1976-77 drought.

PEAK DEMAND MANAGEMENT

Water system demand patterns are a result of climatological, land use, sociological, and institutional factors, all of which affect the amount of water consumed. As described in Chapter 1, the City of Garden Grove is in the process of installing microprocessors at three of its reservoirs, in order to reduce excessive pressure peaking. An energy cost savings of 20 percent is expected. The City will also install microprocessors for the remaining reservoirs as funding permits.

In addition, the City of Garden Grove has asked the Parks Division and Garden Grove School District to irrigate only at night when water demands are low, thereby reducing peak demand requirements.

CHAPTER 9
PRICING, RATE STRUCTURES AND REGULATIONS

Section 10632(f) of the Act requires urban water suppliers to review water rate structures and how the application of these structures has contributed to efficient water use. In general, retail water rates in Orange County are the sum of wholesale agency rates and the costs of production and distribution unique to each retailer. MWDOC's Urban Management Plan provides an overview of current and future water pricing, regulations and rate structure by wholesale agency. This chapter provides a summary of Garden Grove's current rate structure.

GARDEN GROVE'S RATE STRUCTURE AND PRICES

Currently, the City of Garden Grove uses a three part variable rate structure consisting of a minimum (dollar) charge, a minimum (quantity) allowance and a unit charge.

The rate structures are summarized as follows:

1. The minimum (dollar) charge can be a zero dollar and upward amount. These funds are generally collected as minimum debt requirements.
2. The minimum (quantity) allowance can be zero cubic feet and up. Quantities are included within the minimum (dollar) charge.
3. The unit charge is a cost expressed in cents per cubic feet (commodity delivery charge).

With Garden Grove's present prices and regulations proving adequate, even during periods of drought, changes have not been necessary. As the City continues its efforts in water conservation, pricing and regulation needs will continue to be evaluated and, if necessary, revised with City Council approval. Table 10 summarizes the rate structure with costs.

TABLE 10

WATER RATES

- MINIMUM CHARGE. The minimum charge for metered service shall be:

METER SIZE IN INCHES	BI-MONTHLY MINIMUM CHARGE	CUBIC FEET OF WATER
5/8 X 3/4	$ 6.00	600
1	$ 16.00	1,300
1 1/2	$ 31.00	2,600
2	$ 47.00	3,000
3	$ 78.00	3,500
4	$108.00	4,500
6	$247.00	6,000

- COMMODITY DELIVERY CHARGE. The commodity delivery charge to be charged and collected for all water delivered in excess of that included in the minimum charge, shall be $0.665 per hundred cubic feet of water.

FIRE SERVICE

2" or less	$9.00 - $11.00
3"	12.00 - 14.00
4"	16.00 - 19.00
6"	24.00 - 29.00
8"	32.00 - 38.00
10"	40.00 - 48.00
12"	48.00 - 58.00

SOURCE: CITY OF GARDEN GROVE WATER SERVICES, 1990.

CHAPTER 10
CONCLUSIONS AND RECOMMENDATIONS

As pointed out in MWDOC's Urban Water Management Plan, an appropriate water conservation program requires several characteristics in order to be successful. The program must be diverse and multifaceted in order to reach various target groups and achieve increased levels of water awareness. The fundamental component of any comprehensive water conservation program is education. Collectively, the program elements must compliment, reinforce, and build upon one another to increase water awareness.

An effective water conservation program aimed at developing a greater level of water awareness will require the coordination and facilitation of a number of key tasks between MWDOC, the City of Garden Grove, OCWD, MWD, and the California Department of Water Resources. The City of Garden Grove will continue to actively participate in working with all agencies in Orange County to implement and maintain an effective water conservation program.

EXHIBIT A

ORDINANCE NO.

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF GARDEN GROVE AMENDING TITLE XIV OF THE GARDEN GROVE MUNICIPAL CODE TO ESTABLISH A WATER CONSERVATION PROGRAM.

WHEREAS, California Water Code Section 375 et seq. enables public entities which supply water at retail to adopt and enforce a water conservation program to reduce the quantity of water used by their customers and to conserve the water supplies of the public entity;

WHEREAS, periodic droughts are a historic fact in the State of California;

WHEREAS, California is entering a fifth consecutive year of below normal precipitation;

WHEREAS, a water shortage could exist based upon the occurrence of one or more of the following conditions:

(a) A general water supply shortage due to limited supplies or increased demand,

(b) Distribution or storage facilities of the Metropolitan Water District of Southern California, the City of Garden Grove, or other agencies become inadequate,

(c) A major failure of the supply, storage, and distribution facilities of the Metropolitan Water District of Southern California, the Municipal Water District of Orange County, or the City of Garden Grove occurs; and

WHEREAS, because of conditions prevailing in the City of Garden Grove, the general welfare requires that the water resources available to the City be put to maximum beneficial use to the extent capable, that the waste, unreasonable use, or unreasonable method of use of water be prevented and that the conservation of water be encouraged with a view to the maximum reasonable and beneficial use thereof in the interests of the people of the City of Garden Grove and the public health, safety, and welfare.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF GARDEN GROVE DOES ORDAIN AS FOLLOWS:

Section 1. Amendment of Code.

Title XIV of the Garden Grove Municipal Code is hereby amended to add Chapter 14.4 as follows.

Chapter 14.4 WATER CONSERVATION PROGRAM

14.40.010 Application. The provisions of this Chapter shall apply to all persons, customers, and property served by the City of Garden Grove water services.

14.40.020 Authorization. The City Manager or a designated representative is hereby authorized and directed to implement the provisions of this Chapter.

14.40.030 Mandatory Conservation Phase Implementation. The City shall monitor the projected supply and demand for water by its customers on a daily basis. The City Manager, with the assistance of the Public Services Director, shall determine the extent of the conservation required through the implementation and/or termination of particular water conservation stages in order for the City to prudently plan for and supply water to its customers.

14.40.031 Procedure for Declaring the Implementation and/or Termination of Various Water Conservation Stages. Based upon the daily monitoring of projected water supply and demand, the City Manager shall recommend the declaration of an appropriate stage of water conservation in accordance with the provisions of this Section. A recommendation for implementation of any stage beyond Stage 1 (Voluntary Compliance - Water Watch) shall be reported to the City Council at its next regular meeting. The City Council shall thereupon ratify the declaration, rescind the declaration, or direct the declaration of a different stage. The stage declared and associated regulations shall become effective immediately upon announcement.

14.40.032 Announcement of a Water Stage Declaration. The declaration of any water conservation stage beyond Stage 1 shall be made by public announcement or notice. Such announcement or notices shall be published a minimum of three (3) consecutive times in a newspaper of general circulation.

14.40.040 Water Conservation Stages. No customer of the City shall knowingly make, cause, use, or permit the use of water supplied by the City for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner in excess of the amounts authorized by this Chapter, or during any period of time other than the periods of time specified in this Chapter. At no time shall water be wasted or used unreasonably. The following stages shall take effect upon declaration as herein provided.

14.40.041 Stage 1 -- Voluntary Conservation - Water Watch. Stage 1 applies during times of regional drought when, in the spirit of cooperation, the City desires to assist in overall water conservation and water consumption reduction. During Stage 1, the following water conservation measures shall apply on a voluntary basis:

(a) Lawn watering and landscape irrigation should be limited to once every other day, unless a hand-held hose equipped with a positive shut-off nozzle, a hand-held bucket, or a drip irrigation system is used. It also is suggested that watering be done between the hours of 6:00 p.m. and 10:00 a.m. the following morning, to minimize usage during peak hours.

(b) The washing of autos, trucks, trailers, boats, airplanes, and other types of mobile equipment should be limited to once every other day unless done at a commercial car wash.

(c) The filling or refilling of swimming pools, spas, ponds, and artificial lakes should be limited to once every other day.

(d) Watering of golf courses, parks, schools, grounds, and recreational fields is recommended between the hours of 4:00 p.m. and 10:00 a.m. the following morning, to minimize usage during peak hours.

(e) Water should not be used to wash down sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas, except to alleviate immediate fire or sanitation hazards.

(f) Restaurants should avoid serving water to their customers unless the customers specifically request it.

(g) It is recommended that ornamental fountains or similar structures not be operated.

(h) The use of water from fire hydrants should be limited to fire fighting, system testing and related activities, for construction activities, or for other activities necessary to maintain the public health, safety, and welfare.

14.40.042 Stage 2 -- Mandatory Conservation - Water Alert. Stage 2 applies during periods when the probability exists that the City will not be able to meet all of the water demands of its customers. During Stage 2, the following water conservation measures shall apply on a mandatory basis, except when reclaimed or recycled water is used.

(a) Lawn watering and landscape irrigation, including construction meter irrigation, is permitted only on designated irrigation days between the hours of 6:00 p.m. and 10:00 a.m. the following morning. For purposes of Stage 2 regulations, a "designated irrigation day" is determined by the last digit in the street address. Properties with addresses ending in an even number may use water on even numbered days, and properties with addresses ending in an odd number may use water on odd numbered days.

EXCEPTION: Watering is permitted at any time on any day if a hand-held hose equipped with a positive shut-off nozzle, a hand-held faucet-filled bucket of five (5) gallons or less, or a drip irrigation system is used.

(b) Agricultural users and commercial nurseries as defined by the Metropolitan Water District Code are exempt from Stage 2 irrigation restrictions, but are required to curtail all non-essential water use. The watering of livestock and irrigation of propagation beds are permitted at any time.

(c) Washing of autos, trucks, trailers, boats, airplanes, and other types of mobile equipment is permitted only on designated irrigation days between the hours of 6:00 p.m. and 6:00 a.m. the following morning. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shut-off nozzle for quick rinses.

EXCEPTIONS: Washing is permitted at any time on the immediate premises of a commercial car wash. Washing also is permitted without the above restrictions where the health, safety, and welfare of the public is contingent upon frequent vehicle cleaning, such as with refuse trucks and vehicles used to transport food and perishables.

(d) Filling or refilling of swimming pools, spas, ponds, and artificial lakes is permitted only on designated irrigation days between the hours of 6:00 p.m. and 6:00 a.m. the following morning.

(e) Watering of golf courses, parks, schools, grounds, and recreational fields is permitted only between the hours of 4:00 p.m. and 10:00 a.m. the following morning.

EXCEPTION: Golf course greens may be watered at any time.

(f) The use of water from fire hydrants shall be limited to fire fighting, system testing, and related activities, for construction activities, or for other activities necessary to maintain the public health, safety, and welfare.

(g) Water shall not be used to wash down sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas, except to alleviate immediate fire or sanitation hazards.

(h) Restaurants shall not serve water to their customers except when specifically requested.

(i) The operation of any ornamental fountain or similar structure is prohibited.

14.40.43 Stage 3 -- Mandatory Conservation - Water Warning. Stage 3 applies during periods when the City will not be able to meet all of the water demands of its customers. During Stage 3, the following water conservation measures shall apply except when reclaimed water is used:

(a) Lawn watering and landscape irrigation, including construction meter irrigation, is permitted only on designated irrigation days and only between the hours of 6:00 p.m. and 6:00 a.m. the following morning. For purposes of Stage 3 regulations, the "designated irrigation day" is determined by the last digit in the street address. Properties with addresses ending in an even number may use water on Tuesdays and Saturdays. Properties with addresses ending in an odd number may use water on Wednesdays and Sundays.

(b) Agricultural users and commercial nurseries shall use water only between the hours of 6:00 p.m. and 6:00 a.m. the following morning. The watering of livestock and the irrigation of propagation beds are permitted at any time.

(c) Washing of autos, trucks, trailers, boats, airplanes, and other types of mobile equipment is prohibited.

EXCEPTION: Washing is permitted at any time on the immediate premises of a commercial car wash. Washing also is permitted where the public health, safety, and welfare is contingent upon frequent vehicle cleaning, such as with refuse trucks and vehicles used to transport food and perishables.

(d) The use of water by all types of commercial car washes not using partially reclaimed or recycled water shall be reduced in volume by twenty (20) percent.

(e) Filling or refilling of swimming pools, spas, ponds, and artificial lakes is permitted only on designated irrigation days between the hours of 10:00 p.m. and 6:00 a.m. the following morning.

(f) The use of water softening devices is prohibited.

(g) Watering golf courses, parks, school grounds and recreational fields is permitted only between the hours of 6:00 p.m. and 6:00 a.m. the following morning.

EXCEPTION: Golf course greens may be watered at any time.

(h) The use of water from fire hydrants shall be limited to fire fighting, system testing, and related activities, or to other activities necessary to maintain the public health, safety, and welfare.

(i) Water shall not be used to wash down sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas, except to alleviate immediate fire or sanitation hazards.

(j) Restaurants shall not serve water to their customers except when specifically requested.

(k) The operation of any ornamental fountain or similar structure is prohibited.

(l) All water leaks shall be repaired immediately.

(m) New construction meters or permits for unmetered services will not be issued. Construction water shall not be used for earth work or road construction purposes.

(n) The prohibited uses of water as described above are not applicable to that use of water necessary for public health, safety, and welfare or for essential governmental services such as police, fire, and other similar emergency services.

14.40.044 Stage 4 -- Mandatory Conservation - Water Emergency. Stage 4 applies during periods of severe drought and/or when a major failure of any supply or distribution facility, whether temporary or permanent, occurs in the water distribution system of the State Water Project, the Metropolitan Water District, the Municipal Water District of Orange County, or City of Garden Grove facilities. During Stage 4, the following water conservation measures shall apply, except when reclaimed or recycled water is used:

(a) All outdoor irrigation of vegetation is prohibited.

(b) The use of water for agricultural or commercial nursery purposes, except for livestock watering, is prohibited.

(c) Washing of autos, trucks, trailers, boats, airplanes, and other types of mobile equipment is prohibited.

EXCEPTION: Such washings are exempted from the above regulation where the health, safety, and welfare of the public is contingent upon frequent vehicle cleaning, such as with refuse trucks and vehicles used to transport food and perishables.

(d) The filling, refilling or adding of water to swimming pools, spas, ponds, and artificial lakes is prohibited.

(e) The use of water-softening devices is prohibited.

(f) Watering of all golf course areas is prohibited. Watering of parks, school grounds, and recreation fields is prohibited, with the exception of plant materials classified as being rare, exceptionally valuable, or essential to the well being of rare or endangered animals.

(g) The use of water from fire hydrants shall be limited to fire fighting, system testing, or related activities necessary to maintain the public health, safety, and welfare.

(h) Water shall not be used to wash down sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas, except to alleviate immediate fire or sanitation hazards.

(i) Restaurants shall not serve water to their customers except when specifically requested.

(j) The operation of any ornamental fountain or similar structure is prohibited.

(k) New construction meters or permits for unmetered service will not be issued. Construction water shall not be used for earth work or road construction purposes.

(l) The use of water for commercial, manufacturing, or processing purposes shall be reduced in volume by fifty (50) percent.

(m) No water shall be used for air conditioning purposes.

(n) All water leaks shall be repaired immediately.

(o) The prohibited uses of water as described above are not applicable to that use of water necessary for public health, safety and welfare, or for essential governmental services such as police, fire, and other similar emergency services.

14.40.05 Notice of Violation. Except as otherwise provided in Section 145.40.09, prior to enforcement, any person who is suspected of violating this Chapter may be given a written notice containing the description of the violation. This person then shall have 24 hours to correct the violation.

14.40.06 Failure to Comply. Except as otherwise provided in Section 14.40.09, for the first failure to comply, the City of Garden Grove may immediately install a flow restricting device in the customer's water service line for a period not less than 48 hours and until the customer satisfies the City that failure to comply will not continue. The customer shall pay $50.00 for installing and removing the flow restricting device prior to the removal of the device.

Except as otherwise provided in Section 14.40.09, for the second or subsequent failure to comply with this Chapter, the City of Garden Grove may discontinue water service for a period of not less than 24 hours and until the customer satisfies the City that failure to comply will not continue. The customer shall pay $150.00 for restoration of water service, prior to the restoration of water service.

14.40.07 Appeal Procedure. Except as otherwise provided in Section 14.40.09, a customer shall have the right to appeal by filing a written request for appeal within fivee (5) days with the City Manager or its designee. Within (10) days after receipt of a request, a written decision shall be issued. The decision of the City Manager or its designee shall be final.

14.40.08 Violations. Any person violating any of provision of this Chapter or failing to comply with any of the mandatory requirements of this Chapter, is guilty of a misdemeanor, regardless of whether a flow restricting device is installed. If, after any order of the City made pursuant to this Chapter has become final, the person to whom such order is directed shall fail, neglect, or refuse to obey the order, the person shall also be guilty of a misdemeanor. Violation of any City order shall constitute an offense separate from each and every other violation of this Chapter. Any person violating any provision of this Chapter or any City order, shall be guilty of a separate offense for each and every day during any portion of which any violation of this Chapter is committed, continued or permitted by any person.

14.40.09 Alternative Actions. Nothing in the foregoing sections shall be construed to prevent the filing of a criminal action, or a civil court action or to enjoin any violations, pursuant to applicable law, if deemed legally appropriate by the City Attorney.

Section 2. Severability.

If any section, sub-section, clause, or phrase in this Ordinance or the application thereof to any person or circumstances is for any reason held invalid, the validity of the remainder of the Water Conservation Program or the application of such provisions to other persons or circumstances shall not be affected.