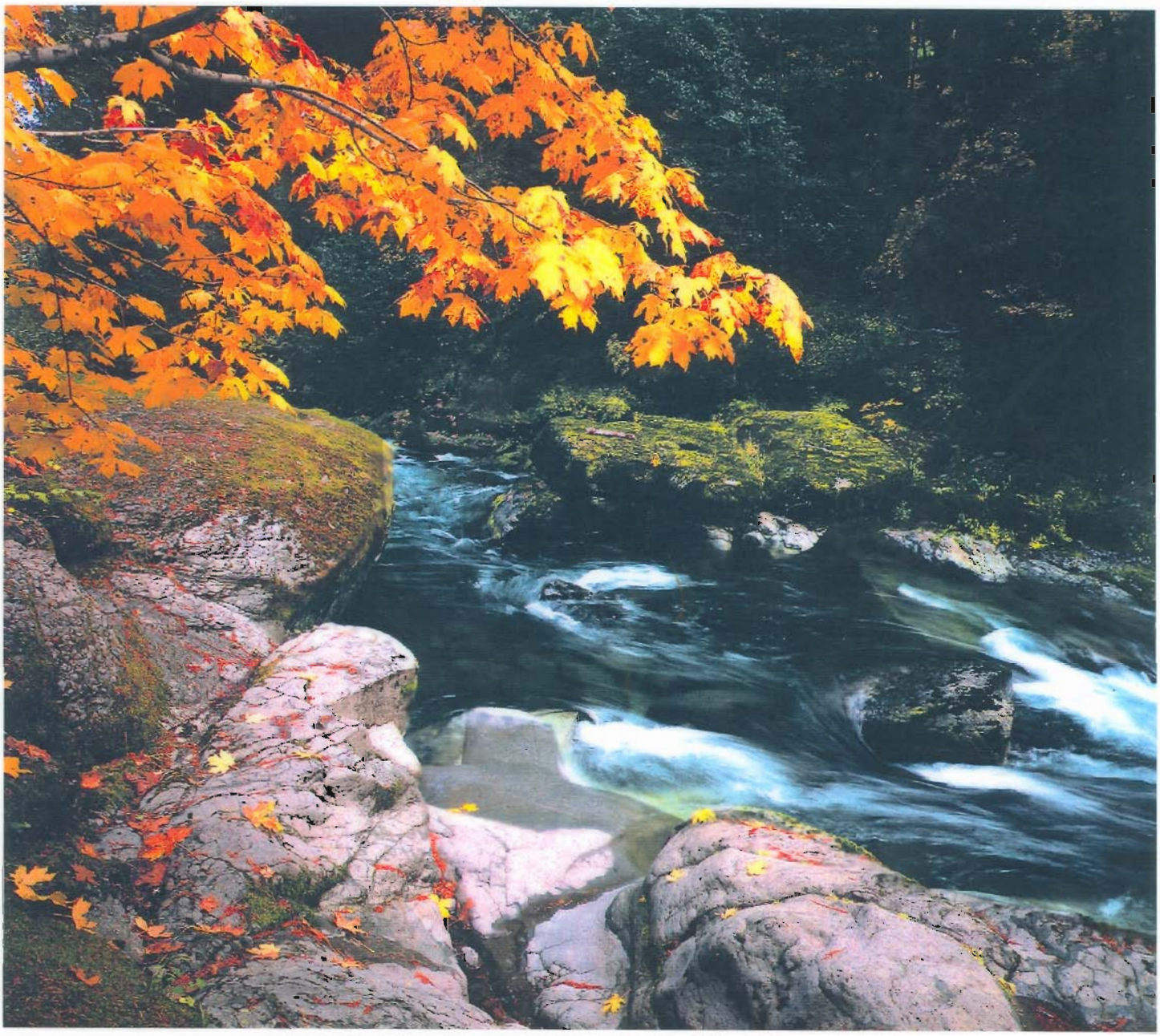
City of Salem



THE WATER SYSTEM MASTER PLAN

CH2M HILL

June 7, 1994

City of Salem
The Water System Master Plan

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CH2M HILL

Corvallis, Oregon

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CONTENTS

	Page
The Water System Master Plan	1
Plan Goals	1
Description of Existing Facilities	2
Water Use	4
Future Issues	5
Water Sources	8
Treatment Facilities	10
Transmission Pipes	10
Storage	12
Distribution System	15
Master Plan	15
Conclusions and Recommendations	18
Conclusions	18
Recommendations	21
Policies	22
Engineering Criteria	22
Water Rights	22
Salem Area Comprehensive Plan	22
Water Conservation	22
Reserve Capacity	23
Water Service Outside Salem's City Limits	23
Water Supply Quality	23
Fire Flow Criteria	23
1S0 Rating for Salem's Water System	23
Future Improvements to Serve Outside the CDA	23
Future Waterline Alignments and Sizing	23
Redundancy for Water Pump Stations	24
Basic Design Criteria	24
Developer-Supplied Engineering Calculations	25
Service Levels	25
Reference Documents	25

Attachment A: Planned Distribution Improvements Maps

CONTENTS (continued)

Page

Tables

1 Major Capital Improvement Projects 20

Figures

1 Existing Supply Facilities 3
2 Projections for Average Use 6
3 Projections for Maximum Use 7
4 Forecast of Required Treatment Facilities 11
5 Forecast of Required Upper Transmission Facilities 13
6 Forecast of Required Lower Transmission Facilities 14
7 Forecast of Required Emergency Storage Facilities 16
8 Proposed Supply Facilities 17
9 Alternative Water Master Plan Strategies 19

The Water System Master Plan

Salem's *Water System Master Plan* is a guide to the future. It outlines a program to ensure that Salem customers continue to receive the same high-quality drinking water and adequate quantities they have grown accustomed to.

The last major supply project was in 1971.

Adequate supplies of high-quality drinking water do not just happen. It was nearly 60 years ago when the City turned to the North Santiam River for its water supply and began large-scale projects to transport the water 17 miles to its users. Other treatment, transmission, and storage projects were constructed in the 1950s, 1960s, and into the early 1970s to complete the backbone of the present system. The system has operated reliably with no major modifications for more than 20 years.

A drinking water system must provide safe water for consumption. Salem's system also provides a desirable product to industrial users. The water is low in minerals and other constituents, making it suitable for canneries or electronics industries with a minimum of customer treatment.

The City's last master plan study was prepared in 1968. Both population growth and comprehensive changes in drinking water regulations made it necessary to develop a new master plan for the next 20 years and beyond.

Plan Goals

In its simplest form, the *Water System Master Plan* answers four questions:

- What is the water conservation policy of the City?
- What source(s) of water should be used?
- What treatment is needed?
- How can water best be delivered to customers?

The plan seeks to provide answers to these fundamental questions by explaining a range of factors: economics, regulations, water quality, reliability, flexibility, operations, environmental issues, and timing of improvements.

The end product of the master plan is a list of recommended improvements, their estimated costs, and a schedule for implementing them. Some of the improvements are required by state and federal regulations; the number of standards for drinking water have

increased more than three-fold since the mid-1980s and Salem, like most communities, will need to make changes to ensure compliance. But the majority of improvements will be to replace aging facilities that are wearing out, for growth and for reliability.

Description of Existing Facilities

Salem's present water system is unique to the Pacific Northwest. It uses a simple, reliable filtration system that is not uncommon for small communities, but such a system is not used by other cities serving a similar-sized population–more than 100,000. The filtration method is called slow sand filtration. Water from the North Santiam River is passed through a bed of fine sand at a slow rate (hence, its name) compared to more mechanical, chemical-dependent methods. Natural, biological processes are relied upon to remove impurities and disease-causing bacteria. The City is able to use slow sand filtration because its water source, the North Santiam River, is nearly pristine. Regular sampling upstream of the intake is conducted by the City to ensure that activities in the watershed do not impair the river's quality. For Salem's customers, the result is a pure-tasting, safe drinking water at an affordable cost.

A parallel and similar system, called an infiltration gallery filtration system, is used for a smaller portion of the water being treated. These and other supply facilities are schematically represented in Figure 1.

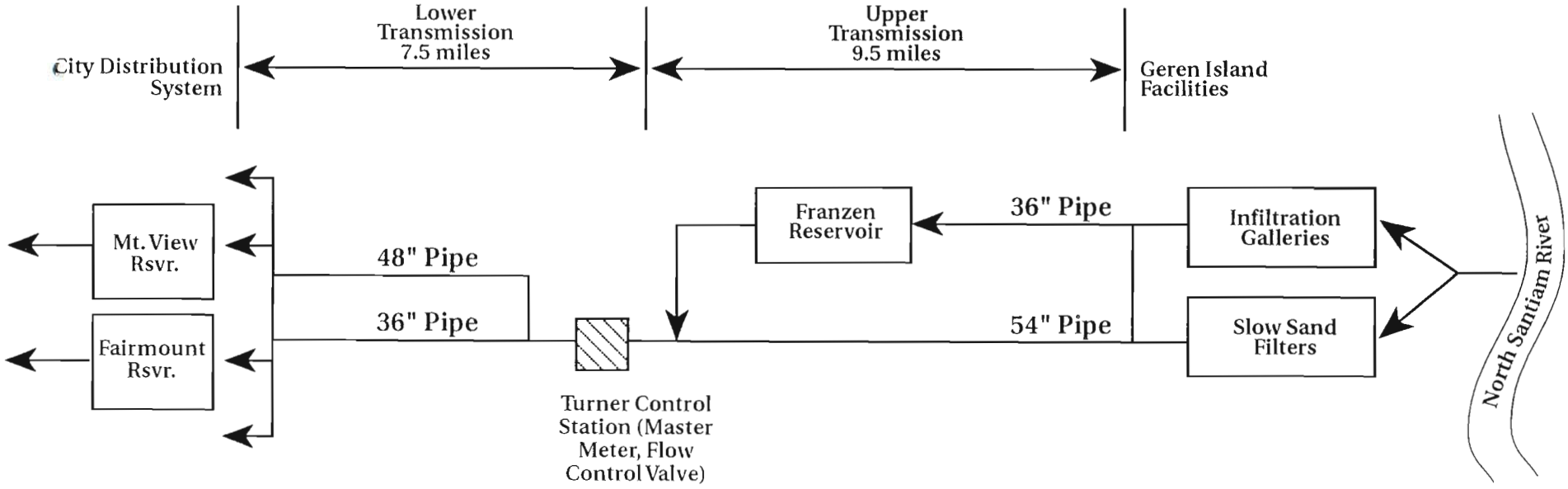
Senior water rights on the North Santiam River date back to 1856.

Foresight in planning the City's water system is demonstrated in its acquisition of water rights. In the mid-1900s, the City purchased early priority water rights on the North Santiam River that not only meet the community's needs in 1993, but are projected to provide adequate water for at least another 50 years. These rights have priority dates of 1856 and 1866. Only the State of Oregon holds an earlier right for the North Santiam River. The total amount of senior rights held by Salem equals about 147 million gallons per day, compared to the highest amount ever used by the City of 60 million gallons in one day.

Transmission piping from Geren Island is approaching its useful life.

Two large pipelines carry water 17 miles from the intake and filtration facilities to the City. One pipeline is a 36-inch-diameter pipe that was constructed in 1937. The other is a 54-inch-diameter pipe that was constructed in 1957. Together, these two lines have a delivery capacity of about 66 million gallons per day. Water use within the City is approaching this level, which means either a new pipeline will need to be constructed in the near future, or a second source of

Figure 1
Existing Supply Facilities



water closer to the City must be developed. Another concern is that the 36-inch pipeline, installed in 1937, is less dependable because of its age.

For an emergency supply, the City relies mainly on Franzen Reservoir. This is a large, uncovered reservoir located close to the City of Turner with a storage capacity of about 100 million gallons. Smaller storage facilities are distributed throughout the City.

Seventy percent of Salem's water is delivered by gravity, which contributes to low rates.

About 70 percent of Salem's water is delivered by gravity to its customers. This also contributes to reliable operations and low user rates. Pumping is only required for the higher elevations in the south and west areas of the City. A network of more than 500 miles of pipe, 17 pump stations, and 13 reservoirs provides continuous service to nearly 140,000 people throughout the community.

Water Use

Water users include residential, commercial, and industrial customers. The average total use during 1992 was about 29 million gallons per day, which translates to about 20,000 gallons being used every minute.

Maximum day use is now 60 million gallons per day.

Like other Pacific Northwest cities, water use in Salem is highly seasonal. More water is used in the summer than in the winter because of irrigation. This difference is further heightened in Salem by the presence of food processing industries that use a lot of water during summer months. Compared to the present average use of 29 million gallons per day, the highest use during the summer may reach more than 60 million gallons per day.

On a per person basis, water use averages about 190 gallons per day. This figure includes commercial and industrial use as well as lawn and garden irrigation. The 190-gallon average is based on totaling all water used during the course of a year divided by the total population served. This water consumption is typical of other Northwest cities of similar size.

Future water needs were based on population projections from the *Salem Area Comprehensive Plan*, assuming that per capita use will remain constant. In a 20-year period, average use is expected to grow to about 43 million gallons per day, and maximum use to 104 million gallons per day. These figures represent about a 50 percent increase over present levels of use and are based on serving a projected population of nearly 230,000.

Water conservation is targeted at 10 percent.

It may be possible to lower these usage numbers through conservation measures; in fact, the *Water System Master Plan* assumes the success of a conservation program. Water conservation in the Pacific Northwest came to the forefront during the dry summer of 1992. What had previously been a Southwest, desert concept became a reality in western Oregon as well. The City hopes that through leakage control, industrial audits, public information programs and incentives, and similar measures, the per-person maximum use can be reduced by 10 percent over current levels. Because many facilities must be designed for maximum use rates, this will make it possible to serve a larger population before new facilities are required.

Average use (demand) projections are shown in Figure 2. The graph shows the expected increase in water use over the next 20 years if no conservation measures are taken (upper line) and the impact that conservation could have (lower line). Similar curves for maximum use are shown in Figure 3. The Plan has been developed using the lower demand lines, which show the effect of conservation.

For the purposes of planning supply projects, the City has a policy of maintaining 5 million gallons per day of reserve capacity. That is, supply projects are implemented when demands rise to within 5 million gallons per day of system capacity. This reserve gives the City a cushion, which allows sudden growth spurts or unusually hot and dry weather conditions to be handled without emergency measures.

Future Issues

Improvements will be needed to maintain the City's excellent water system.

Although the water system is sound and has operated reliably to produce safe drinking water, several recognized needs exist that have been addressed in the *Water System Master Plan*. They include:

- **Expansion**. New and larger facilities will be required to accommodate the projected 50 percent increase over present water demands during the planning period.

- **Secondary Source**. A secondary source is desirable to lessen the impact of an emergency that may remove the primary water supply for a period of time. The North Santiam River is an excellent primary source, but a single source leaves the City vulnerable to emergencies. For example, a chemical spill upstream of the City's treatment plant could result in a multiple-day closure of the present system, resulting in total loss of supply capability.

Figure 2
Projections for Average Use

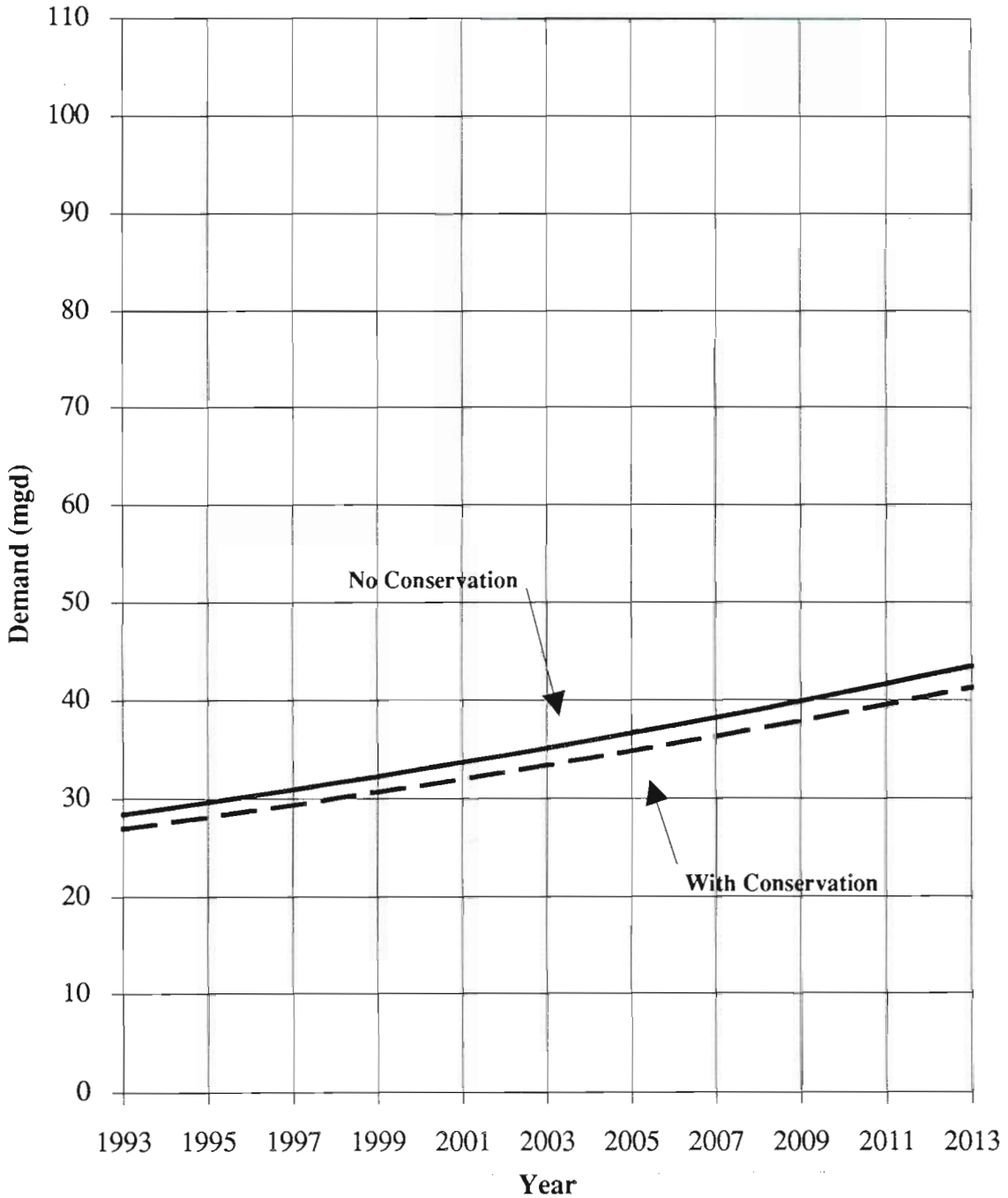
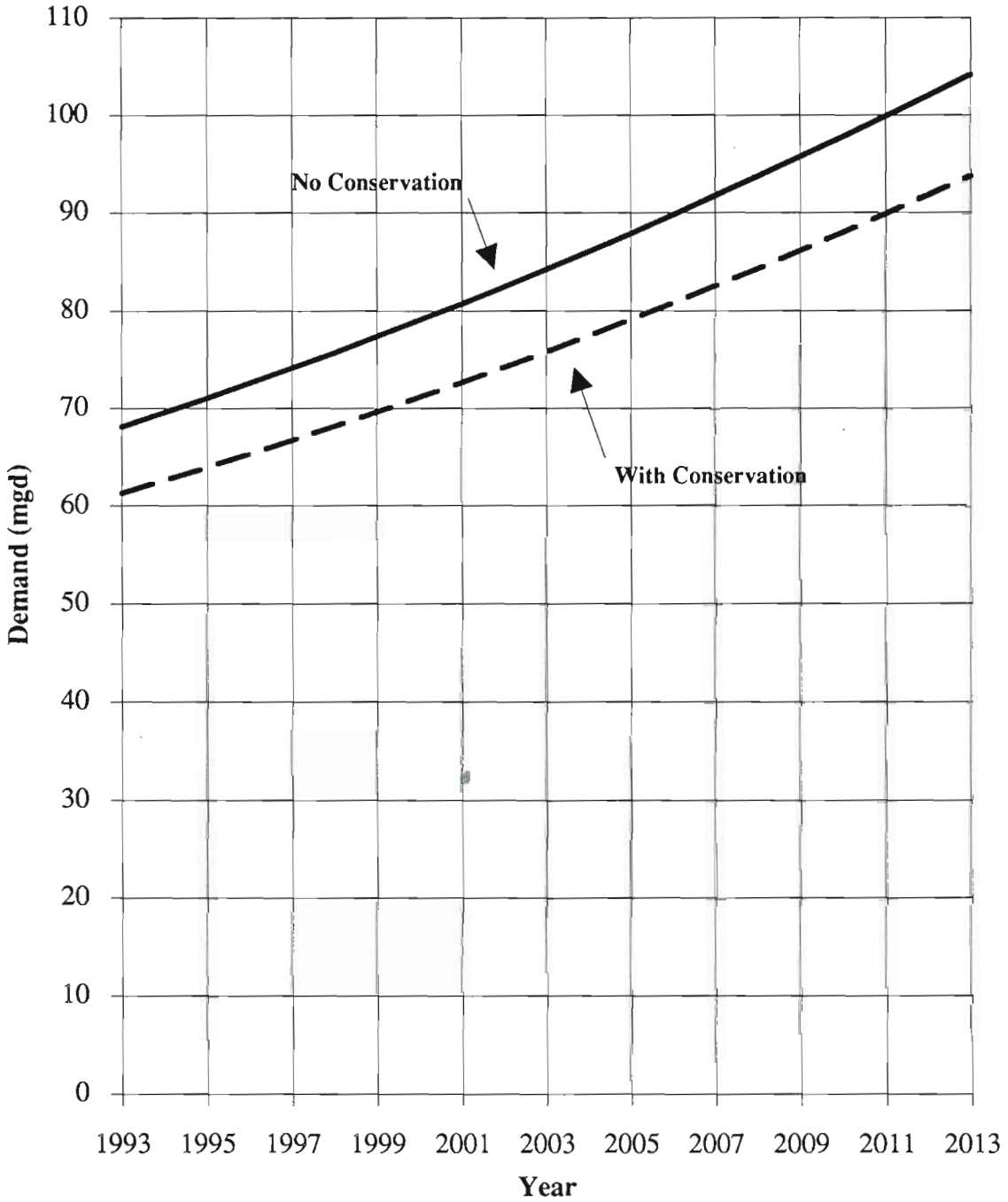


Figure 3
Projections for Maximum Use



- **Emergency Storage.** Short-term emergency storage is mainly provided by Franzen Reservoir, but this uncovered reservoir presents operational, water quality, structural, and regulatory concerns.

- **Backup Filter.** The system has two slow sand filters. When one is being cleaned, which is a 4-day process that is required about every 8 weeks, production capability is cut in half.

The following paragraphs discuss the major changes needed to address these needs.

Water Sources

The City's existing North Santiam River treatment system can supply up to 58 million gallons per day. Senior water rights allow up to 147 million gallons per day to be used, and transmission pipelines currently have a capacity of 66 million gallons per day. The supply capacity is limited by the treatment facilities.

Five source options were identified for meeting water needs above the system capacity of 58 million gallons per day. These were:

- Existing North Santiam River system expansion

- Santiam River, near Jefferson

- Willamette River, about 5 miles south of Salem

- Groundwater from an area northwest of Salem (from an aquifer, or groundwater source, named Mission Bottom)

- Recovered water from wells in south Salem or northwest of Salem that would be recharged with Salem drinking water (called Aquifer Storage and Recovery)

Aquifer Storage and Recovery technology provides an innovative solution to supplying a secondary source.

The Aquifer Storage and Recovery (ASR) option is a relatively new approach for water supply. It involves using a common well to place water into the ground (recharge) when supply capabilities exceed demands. For Salem, this means recharging during the winter months, when demands average less than one-half the system capability. The water is essentially stored in the ground (aquifer storage), so that the same water can be removed (recovered) in the summer when it is needed. One aspect of the master planning effort was a feasibility evaluation of ASR. It was concluded that a 20 million gallon per day supply is feasible in south Salem or in an area northwest of

Salem. Additional pilot level evaluation is recommended to further develop this concept.

Of the five options, only two provide a secondary supply that could meet emergency needs: the Mission Bottom groundwater option, and ASR. The Santiam River and the Willamette River locations are downstream of the North Santiam River, and therefore do not provide a secondary, independent supply. Other factors such as quality of raw water, type of treatment required, and additional cost also reduced the merits of these two potential sources.

Major treatment facilities would be required for the Santiam River, Willamette River, or the Mission Bottom groundwater source. After treatment, the quality of water from the Santiam River and possibly the Willamette River would be comparable to the City's current water quality, and most users would find it to be acceptable. In contrast, the groundwater quality from Mission Bottom, even after treatment, would be distinctive enough that some people would notice a taste difference.

Quantity must also be considered for source options. From a quantity standpoint, the surface supplies are more favorable because the availability of water from the Mission Bottom groundwater source or from ASR cannot be easily predicted.

Other criteria that were used for evaluating the source options included reliability, operational complexities, environmental impacts, public acceptance, and cost.

The North Santiam River continues to be the preferred option for meeting Salem's long-term water needs.

Expansion of the North Santiam River source was the recommended option. It has the lowest development cost, and is favorable with respect to nearly all other criteria. It is the best supply for meeting the long-term needs for Salem; however, it does not provide a secondary source for emergency needs. To meet this criteria, development of ASR is recommended as a complement to the North Santiam River source.

Aquifer Storage and Recovery provides benefits in addition to providing a secondary water source. It can substitute for storage tanks because it provides an emergency water supply. And, because less water is withdrawn from the North Santiam River in the summer, ASR is an environmentally positive approach to meeting emergency and peak water needs.

Although no fatal flaw has been identified for ASR, a further evaluation of the applicability of ASR in areas around Salem will be carried out in a pilot test next year. Results from a test installation will allow the City to further define future plans. Also, issues of state

agency permits must be resolved. Contingency plans have been prepared in the event of better or worse than expected results from ASR.

Treatment Facilities

Salem's slow sand filters provide effective treatment at a low operating cost.

More than any other aspect of the water system, treatment facility needs are governed by drinking water standards set by state and federal agencies. The slow sand filtration system and chlorination for disinfection comply with current regulations. It is anticipated that these processes will remain appropriate, although some minor modifications will be required.

In contrast to the slow sand filters, the infiltration gallery system may not meet the requirements of current drinking water regulations. It appears, however, that the City can continue to use the infiltration gallery system until additional slow sand filtration capacity is installed.

Expansion of the filtration system will be necessary in the near term to handle growing water demands. Significant projects are also planned for the existing two slow sand filters. They are currently unlined earthen basins, and it is recommended that these be lined and their aging piping systems be reconstructed the next time they require routine resanding maintenance. Modern fish diversion screens also need to be added at the river intakes to improve protection of fish. The new screens are required by the state. The addition of the third and fourth filters within the 20-year planning period and the reconstruction of the existing two filters represent several million dollars worth of improvements. However, on a per-gallon basis, treatment costs will continue to be among the lowest in the nation.

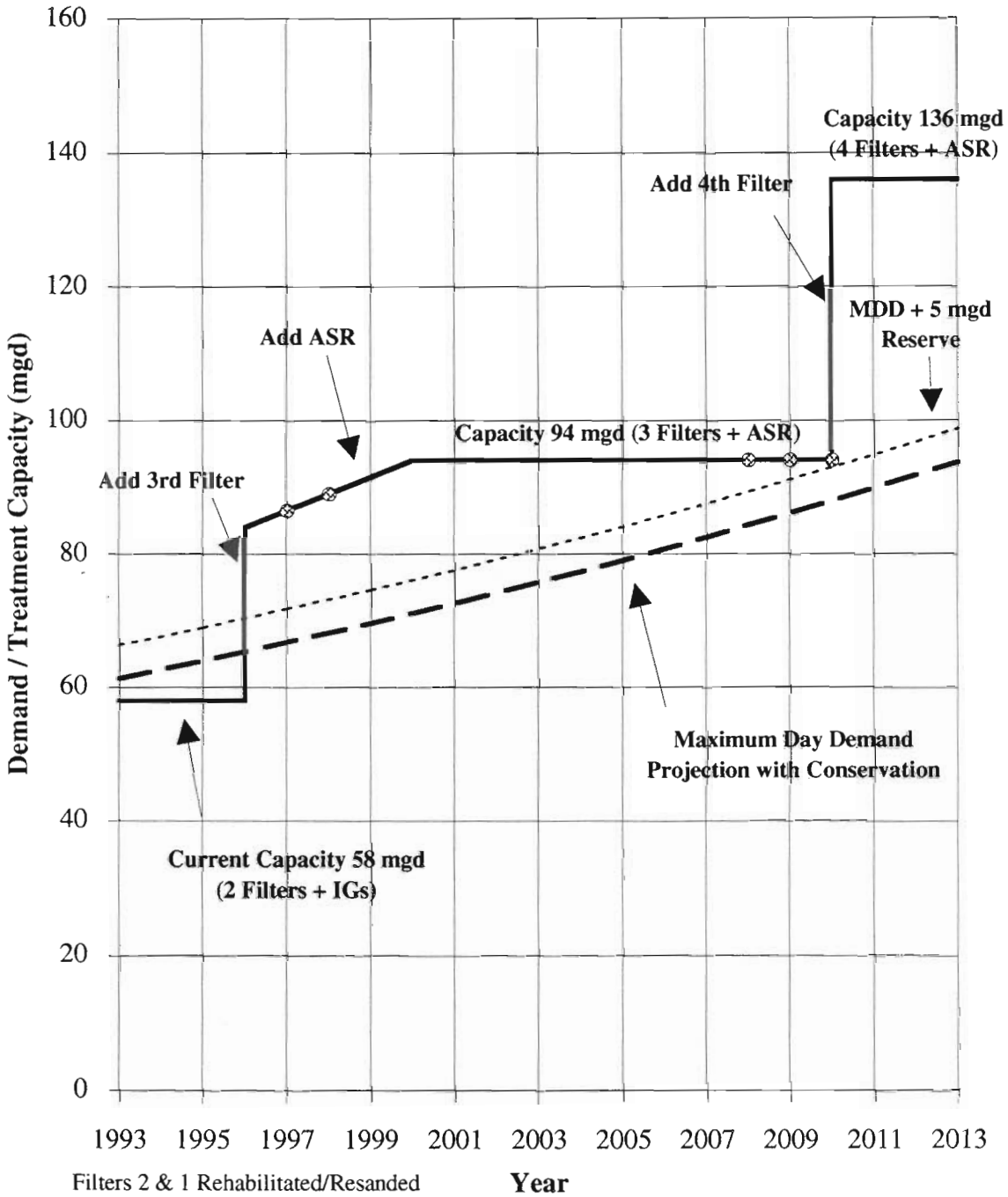
The planned scheduling of these projects is shown in Figure 4. The capacity of the treatment system as it exists today and as it will be following improvements is overlayed on Figure 3, which showed maximum demands. This illustrates that the timing of projects depends on the actual rate at which growth occurs.

Transmission Pipes

Transmission piping limits water delivery to 66 million gallons per day.

Salem's two transmission pipelines can carry up to 66 million gallons per day to Franzen Reservoir, and up to 78 million gallons per day from Franzen Reservoir to the City. The limiting segment is the upper section, from Geren Island to Franzen Reservoir. The capacity concern for this section is amplified by the fact that one of the two pipelines, the older 36-inch-diameter line, is nearing the end of its useful life. City staff have repaired many leaks in this pipeline in recent years, and the possibility of a catastrophic failure exists.

Figure 4
Forecast of Required Treatment Facilities



Filters 2 & 1 Rehabilitated/Resanded in 1997, -98 and Filters 3,2, & 1 Resanded in 2008, -09, -10.

Note: Firm capacity = capacity with largest unit out of service.

The recommended improvement is to replace the 36-inch pipeline with a larger pipeline capable of carrying up to 75 million gallons per day. This amount equals about half of the City's early priority North Santiam River water rights. In the future, when the other line needs replacement, a second line with a 75-million-gallon-per-day capacity could be installed to allow full use of senior North Santiam River water rights.

The lower transmission pipeline is in good repair but capacity will need to be increased in about 10 years to keep pace with growing water use. The planned addition is a 54-inch-diameter pipe for most of the distance, along with some 48-inch-diameter pipe.

Figures 5 and 6 show planned transmission improvements compared to demand projections.

Storage

Water system storage is needed for three purposes: to supplement the supply capacity in meeting the high use periods of the day, to provide a reserve for fighting fires, and to provide a reserve that can be used during an emergency disruption of supply. By far the largest component of these three needs is the reserve for meeting emergencies.

Most of Salem's present storage is provided by Franzen Reservoir. It holds 100 million gallons of the 132 million gallons total for the system. However, for operational, water quality, and cost reasons, it is recommended that Franzen Reservoir be abandoned and replaced with new, covered storage reservoirs. Most operational and water quality problems result because Franzen Reservoir is not covered. It is open to contamination, and security is a concern. Its exposure to sunlight results in a loss of chlorine and algae growth sometimes results. Also, the reservoir needs to be cleaned more frequently than a closed reservoir.

Replacing Franzen Reservoir is cost-effective compared to repair.

As a part of the planning study, the structural and seismic condition of Franzen Reservoir was evaluated. It was determined that significant improvements will be required to ensure that the reservoir would be stable during an earthquake. Adding seismic upgrade and covering costs, it was found that repairing Franzen Reservoir at this time would cost about the same as replacing the reservoir. Replacement is preferred since new, covered storage would provide a longer-term solution at approximately the cost of rehabilitating Franzen Reservoir.

Since an Aquifer Storage and Recovery system is planned, the total amount of emergency storage can be significantly reduced; only 60 million gallons of Franzen Reservoir's 100 million gallons will

Figure 5
Forecast of Required Upper Transmission Facilities

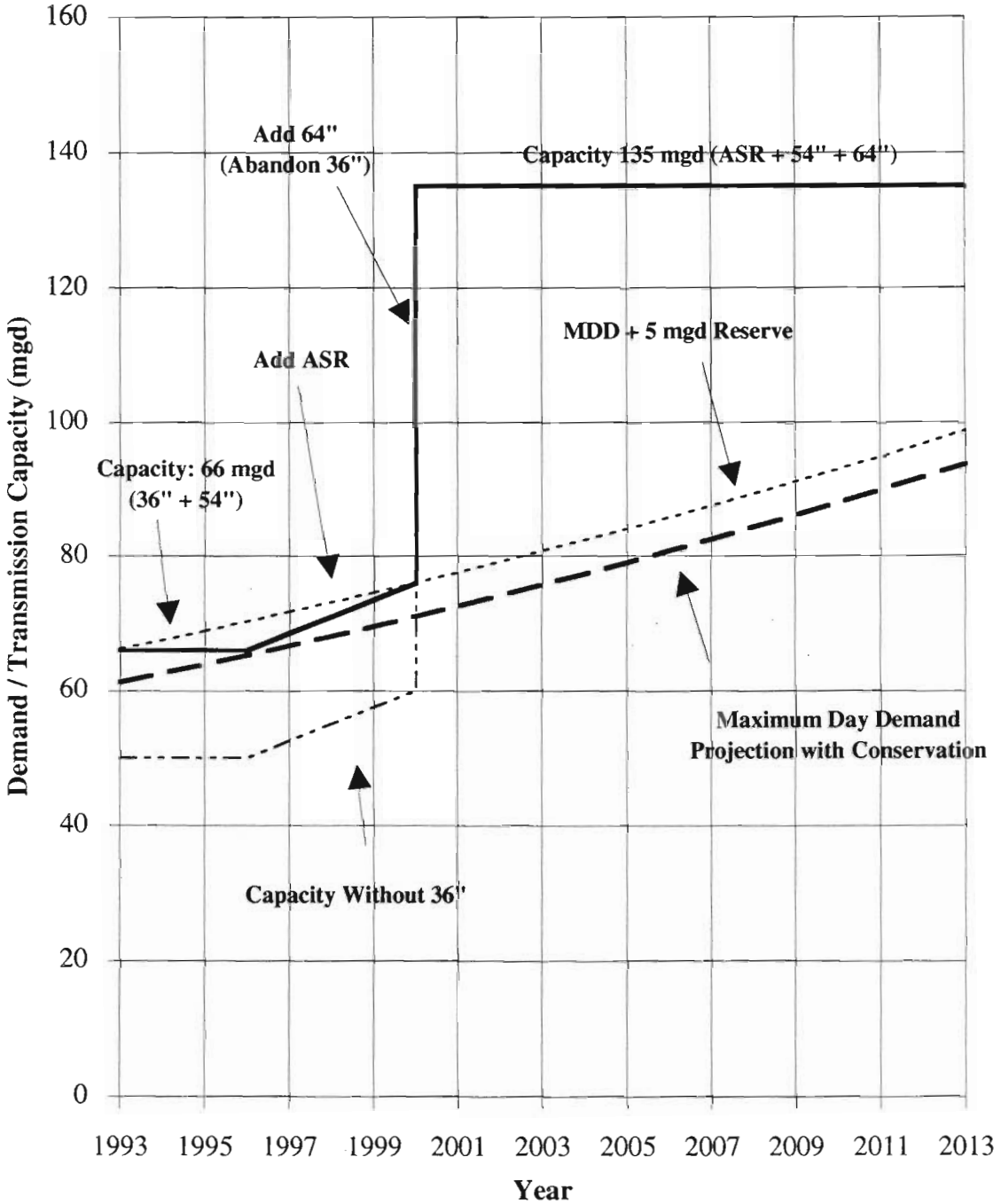
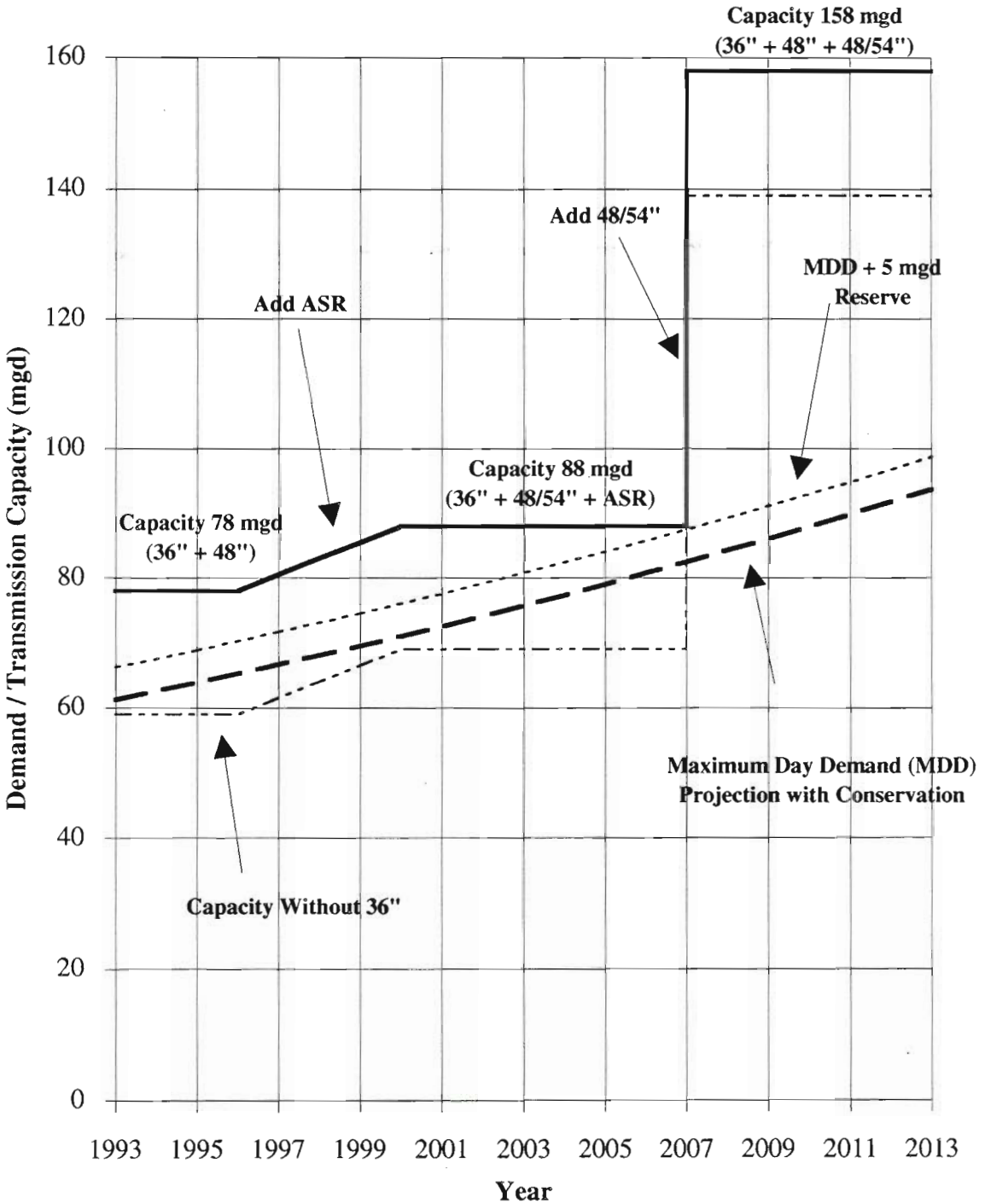


Figure 6
Forecast of Required Lower Transmission Facilities



need to be replaced. The recommended plan is to construct a 40-million-gallon reservoir at the same location as Franzen Reservoir and a 20-million-gallon reservoir within the City. Together with smaller reservoirs that are planned for the distribution system, this system will meet the City's needs for the next 20 years.

Should the ASR project not meet the level of production defined in this Plan, more conventional storage will be required.

A summary of the emergency storage plan is shown in Figure 7.

Distribution System

Over the years Salem has developed a reliable, sound system of pipes, pump stations, and reservoirs for delivering water throughout the community. More than two-thirds of the water delivered is provided by gravity to lower elevation areas. Pump stations and reservoirs are used to supply water to the higher elevation areas in the south and west sections of the City.

A piping system computer model will help evaluate future distribution improvements.

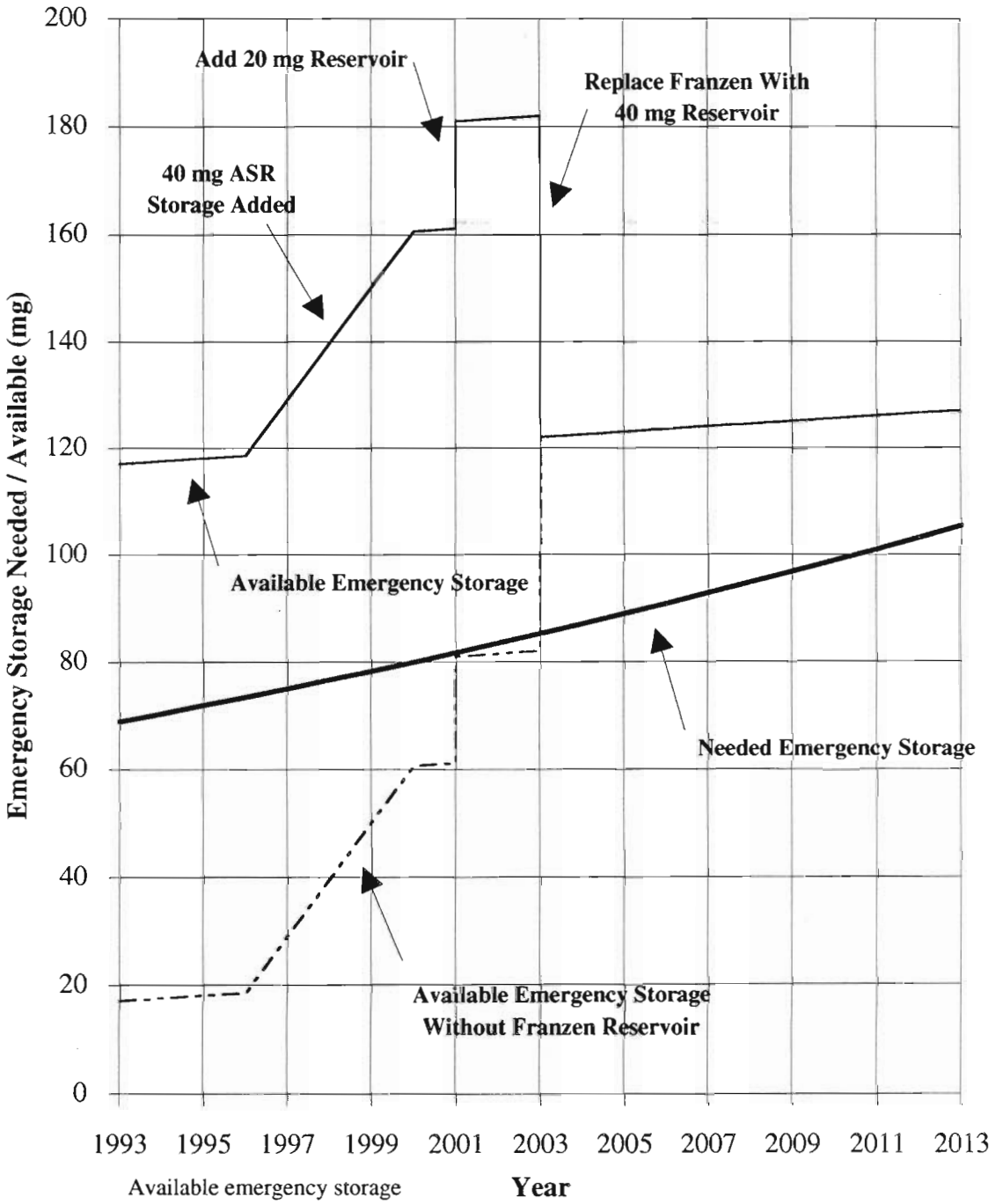
A detailed computer model of the distribution system was created to evaluate the water system's performance. A significant portion of the study effort was spent in combining map information with records of pipe locations, sizes, and types, and pump stations and reservoirs. The model was used to simulate various operating conditions in the system, and to evaluate alternative improvements. It provided a "what if?" capability. City staff will continue to use the model in the future to evaluate specific distribution improvements.

In general, the distribution system is adequate to meet the City's highest flow needs. It can supply water at peak flow rates and can meet fire demands. The only current weaknesses appear to be in small areas in the northeast part of the City and in the west area of the City. Specific pipeline, reservoir, and pumping improvements have been developed to correct these weaker areas. Most other distribution system improvements are growth-driven; that is, they will be needed as new areas develop.

Master Plan

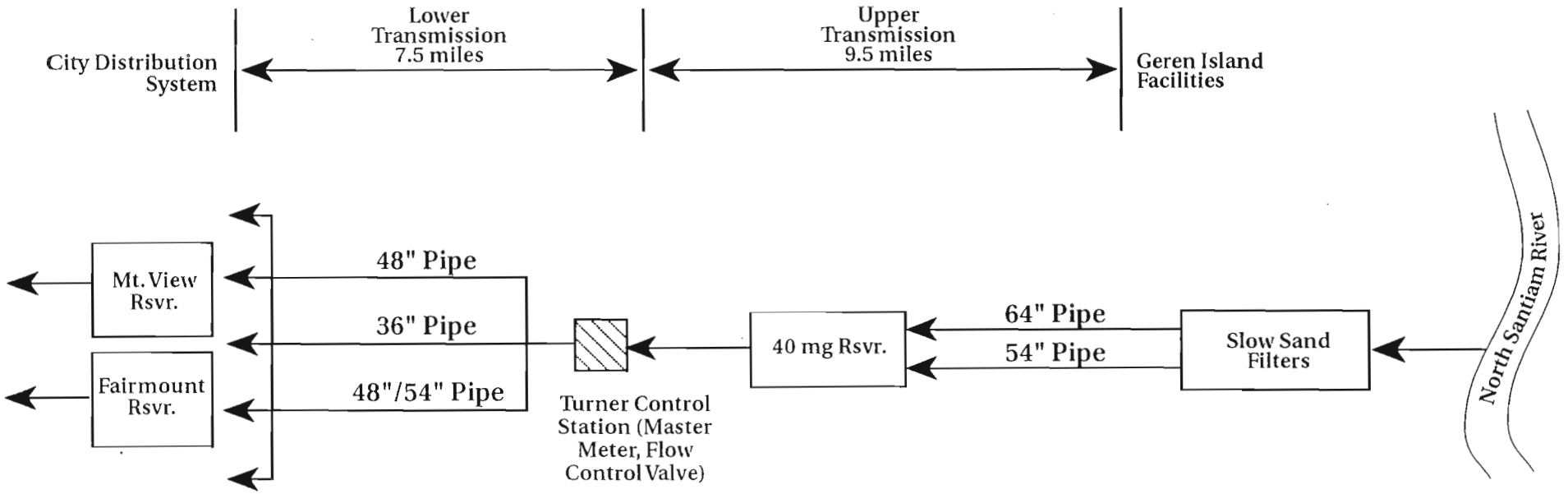
Major improvements to treatment, transmission, and storage facilities have been described in preceding sections. The proposed changes are illustrated in Figure 8, a schematic drawing of supply facilities. As described in the text, certain assumptions were used in planning. They include:

Figure 7
Forecast of Required Emergency Storage Facilities



Available emergency storage includes 10 mg capacity added to the distribution system within 20 years.

Figure 8
Proposed Supply Facilities



- Demands will increase as projected, including a 10 percent reduction because of conservation.

- Franzen Reservoir will be replaced.

- Aquifer Storage and Recovery will provide a viable secondary supply.

Planned improvements are based on the use of Aquifer Storage and Recovery.

Pilot testing of Aquifer Storage and Recovery will be performed and, based on the findings, other plans may need to be followed. Alternative programs for more or less successful ASR outcomes are illustrated in the timelines shown in Figure 9. The "most probable plan" in Figure 9 is the one that has been used in Figures 3 through 7.

Major improvements to be funded by the City and their planned scheduling and costs are summarized in Table 1. Included are source, treatment, transmission, and emergency storage projects. This table is based on the most probable outcome for using ASR as a supply option, as well as assuming that demands grow as projected. Depending on actual population growth, projects may be moved ahead or delayed. The level of conservation achieved will also affect the timing.

Other capital improvements are required in the distribution system, including piping, pumping, and storage facilities. These projects will be funded by future developments and the City. The complete, projected 20-year capital improvement plan is estimated at approximately $170 million.

The 20-year package of improvements is estimated to cost $170 million.

Maps showing planned distribution improvements are included in Attachment A at the end of this report. The locations and sizes were determined based on assumed growth patterns; actual designs must be modified at the time the improvements are implemented.

Conclusions and Recommendations

Conclusions and recommendations were developed through the master planning process. The most important of these are summarized below.

Conclusions

- Water demands are projected to increase by about 50 percent over the next 20 years.

- Conservation measures may reduce maximum day water use by about 10 percent, allowing major projects to be delayed.

Figure 9
Alternative Water Master Plan Strategies

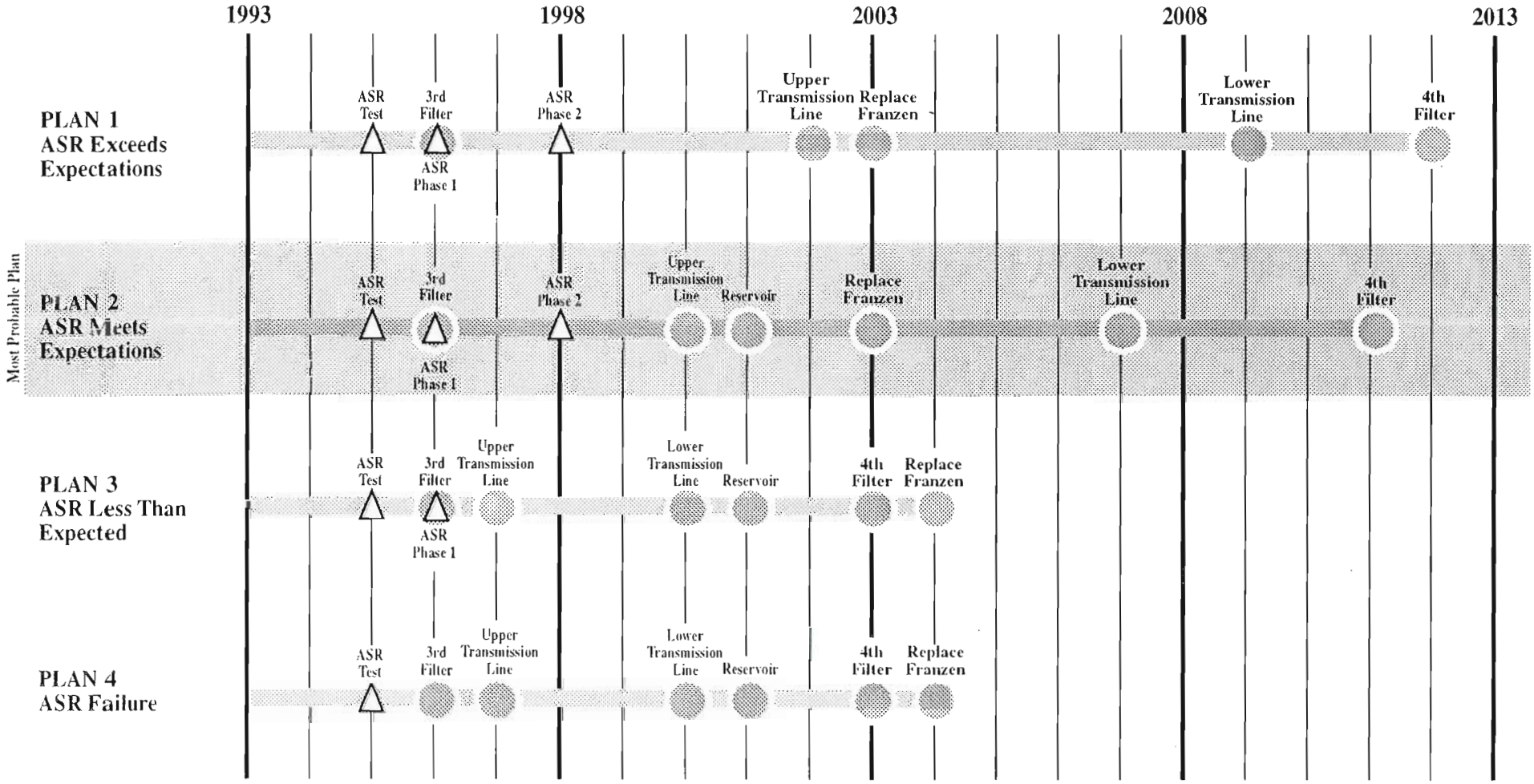


Table 1 Major Capital Improvement Projects		
Item	**Budget Year**	**Estimated Cost (millions)**
Aquifer Storage and Recovery pilot tests	1994-95	0.5
Construct third slow sand filter	1995-96	4.3
Develop Aquifer Storage and Recovery system	1995-99	10.1
Resand and rehabilitate slow sand filter No. 2	1996-97	3.8
Resand and rehabilitate slow sand filter No. 1	1997-98	3.8
Construct fish diversion screens	1997-98	1.4
Construct upper transmission pipeline	1999-00	20.0
Construct 20-mg Mountain View area reservoir	2000-01	8.7
Replace Franzen Reservoir with 40-mg reservoir, construction	2002-03	16.9
Construct lower transmission pipeline	2006-07	9.8
Construct fourth slow sand filter	2009-10	4.3
Total Estimated Cost		**83.6**

Note: Additional capital improvements are required and are shown in the Technical Supplement.

- Water rights on the North Santiam River are adequate to meet the City's needs for the next 50 years.

- Slow sand filtration is an effective treatment process and can continue to be used.

- The infiltration gallery filters may not comply with developing regulations and should not be included in future planning.

- The City is vulnerable to loss of water supply with only one current source.

- Aquifer Storage and Recovery was judged to be feasible in a preliminary study–no fatal flaws were identified.

- Aquifer Storage and Recovery can be used as a secondary source, a peaking source, and emergency supply.

- Franzen Reservoir is at some risk of failure because of seismic activity.

- Costs for repairing and covering Franzen Reservoir are similar to costs for replacing it with new reservoirs.

- The City's distribution system is generally strong and most improvements will be growth-driven.

Recommendations

- Water conservation should be vigorously pursued to meet the objectives of this Plan.

- The North Santiam River should be used as the City's primary source. The Geren Island slow sand filter facilities should be expanded for additional capacity and flexibility.

- Pilot testing of the Aquifer Storage and Recovery system should be performed to determine its supply capability.

- The Aquifer Storage and Recovery System should be implemented based on pilot test findings and recommendations.

- If Aquifer Storage and Recovery implementation is successful, Franzen Reservoir should be replaced with new covered reservoirs, one located at the same location and a second located within the City. If the implementation of Aquifer

Storage and Recovery is not successful, the disposition of Franzen Reservoir should be re-evaluated.

- When the upper transmission pipeline is replaced, the pipeline should be sized for a capacity of 75 million gallons per day.

- Acquire right-of-way for transmission.

- Water use, both average and maximum, should be carefully tracked to determine if the schedule for improvements needs adjustment in coming years.

- Water use should also be tracked for each service level to assist in sizing future pump stations, distribution reservoirs, and pipelines.

Policies

The following policy statements are based on the results, conclusions, and recommendations of the *Water System Master Plan* to help promote the efficient and effective implementation of the plan by the City.

Engineering Criteria

It shall be the policy of the City to follow the engineering planning criteria developed in the *Water System Master Plan Technical Supplement* document to evaluate, design, and construct future improvements to Salem's water system.

Water Rights

It shall be the policy of the City to protect existing and future water rights for the purpose of preserving supply capacity for the City.

Salem Area Comprehensive Plan

It shall be the policy of the City to plan facilities for the population growth projected in the Salem Area Comprehensive Plan.

Water Conservation

It shall be the policy of the City to further develop and implement the water conservation program as detailed in this Plan.

Reserve Capacity

It shall be the policy of the City to maintain a 5-million-gallon-per-day (mgd) water supply reserve at all times. This means that future water supply expansions will be made when the current water demand plus 5 mgd equals the system's capacity. The 5-mgd reserve will provide for unanticipated water needs or greater usage because of unusual weather conditions.

Water Service Outside Salem's City Limits

It shall be the policy of the City to not provide water service to areas outside Salem's existing city limits, except as provided in specific contracts with East Salem Water District, Jan Ree, City of Turner, Eola-Chatnicka, Orchard Heights, and an emergency interconnect with the City of Keizer.

Water Supply Quality

It shall be the policy of the City to supply water from the source with the highest quality and reasonably available water supply.

Fire Flow Criteria

It shall be the policy of the City to implement future water system improvements based on providing sufficient fire flow to meet the values adopted in the Public Works Department Design Standards, which were taken from Insurance Service Office (ISO) requirements.

ISO Rating for Salem's Water System

It shall be the policy of the City to maintain an ISO rating of 1 for the City's water system.

Future Improvements to Serve Outside the CDA

It shall be the policy of the City to require that future improvements to the City's water system to serve property outside the Currently Developed Area (CDA) be paid for by private developers or by system development charges (SDCs). These improvements include waterlines, waterline appurtenances, new water pump stations, expansion to the capacity of existing water pump stations, and storage reservoirs.

Future Waterline Alignments and Sizing

It shall be the policy of the City that future waterline alignments shown in the Master Plan are approximate because of the limited

level of detail contained in a planning document. The final alignment will be determined by the Public Works Director at the time the improvements are required. The future waterline sizes shown in the Master Plan are the sizes necessary to adequately convey projected water demands. The final sizes will be determined by the Public Works Director or staff at the time the improvements are required.

At the time of decision, improvements will be reviewed based on, but not limited to, availability of secondary grid support, hydrant spacing, fire flow requirements, pressure level influence, existing and future demands, and pump station and reservoir capacity availability. Any variation approved must meet the defined pressure and flow equivalence determined in the Plan.

Redundancy for Water Pump Stations

It shall be the policy of the City that water pump stations be designed and constructed to function during a power outage. Pump stations that pump water into service levels that have gravity storage reservoirs shall be designed and constructed to have the piping and valving to bypass the station using a portable pump or have the electrical capability to connect a portable electrical generator to provide power to the station. Large stations may be required to have the capability for onsite emergency power generation.

Closed-end water pump stations (systems with no storage facilities) shall be designed and constructed to include either a second independent power source to the station or a built-in standby power generator capable of providing a minimum 40 pounds per square inch (psi) water pressure at the building entrance.

Basic Design Criteria

It shall be the policy of the City that the basic concept of the water system envisioned in this Plan is a gravity system of reservoirs and pump stations serving a variety of service levels. Isolated service levels (closed-end pump systems) without adequate storage will not be allowed unless approved by the Public Works Director. This includes water service levels created by constructing closed-end water booster pump stations, or service levels created by installing pressure reducing valves. Approval will be contingent upon the provision of adequate fire flow to reasonably serve the area. It is intended that isolated service levels will only be approved where it is not economically feasible or practical to provide adequate storage.

Developer-Supplied Engineering Calculations

It shall be the policy of the City that it is the responsibility of developers to demonstrate compliance with the requirements set forth in this Plan to the satisfaction of the Public Works Director. Such compliance may require the developer to supply independent engineering calculations to prove consistency with the adopted water system hydraulics model.

Service Levels

It shall be the policy of the City to ensure that each water service level retain, at a minimum, the required fire storage at all times. In service levels with multiple storage reservoirs, additional analysis may be required to demonstrate compliance with the criteria for all lower areas served.

Reference Documents

Detailed background to the material in this document is contained in the *Water System Master Plan Technical Supplement*, a copy of which can be reviewed at the Public Works Department or the City Library at the Civic Center.

CVOR357/043.WP5

CITY OF Salem
AT YOUR SERVICE

December 17, 1996

TO: All Holders of the Water System Master Plan

SUBJECT: AMENDMENT TO THE ADOPTED WATER SYSTEM MASTER PLAN IN SOUTH SALEM

The Salem City Council has adopted an amendment to the *Water System Master Plan*, effective September 23, 1996. The amendment affects the S-3 service level in South Salem, and is shown on the enclosed map. Please insert this map in your copy of the Master Plan. It replaces a portion of the fifth map in the bound set.

Essentially, the amendment replaces two proposed reservoir/pump station systems (Creekside and Rees Hill) with a single, larger system consisting of a 2,400 gpm pump station at Creekside, and a 2.25 million gallon reservoir at Champion Hill. It is expected that this change will ultimately save approximately $1.4 million dollars in initial capital costs, while still providing the same level of service that was expected from the two reservoir system.

Sincerely,

T. A. Gerling

Tim Gerling, P.E.
Chief Development Services Engineer

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Attachment: Map

November 1, 2000

TO: All Holders of the Water System Master Plan
All Holders of the City of Salem Design Standards

EFFECTIVE DATE: October 25, 1999 (Ord No. 89-99)

SUBJECT: **DEVELOPMENT BULLETIN #39**

The following information is distributed as a public service to the Salem development community of engineers, architects, contractors, builders, and developers to make them aware of any changes in the City permit and plan approval process, design standards, or construction standards which may have an impact on their operations:

WATER SYSTEM MASTER PLAN NEW MAPS AND AMENDMENT NOTICE

PURPOSE: NOTICE OF CHANGE TO WEST SALEM WATER MASTER PLAN AREA AND REPLACEMENT OF ALL WATER MASTER PLAN MAPS

The Salem City Council approved an amendment revising the adopted Water System Master Plan for West Salem at their October 25, 1999, meeting (Ordinance No. 89-99). The legal notice was issued following that approval. The delay in issuing this development bulletin was to allow staff time to revise all of the maps for the Master Plan document in a new GIS format that shows the service level boundaries and the major links in the water system.

Sheet 1 of 6 shows the adopted revisions for West Salem. This includes eliminating the Michigan City Reservoir and the Deering Pump Station; increasing the size of the Grice Hill Reservoir; and adding water lines on Doaks Ferry Road NW and the Ptarmigan area.

All of the Water System Master Plan maps have been reprinted. Please replace all existing maps with the enclosed maps.

For more information, please contact Public Works Department Utility Planning at 503-588-6211 or 503-588-6292 (TTY).

Tim Gerling, PE
Assistant Public Works Director

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Enclosure:
1) Index to Development Bulletins (Only for Holders of City of Salem Design Standards)
2) Maps

ADA Accommodations Will Be Provided Upon Request

PUBLIC WORKS DEPARTMENT
555 Liberty St. SE / Rm. 325 • Salem, OR 97301-3503 • Phone (503) 588-6211 Fax (503) 588-6025 TTY (503) 588-6292