Exhibit A

STAFF REPORT

INFORMATIONAL BRIEFING ON PRELIMINARY REGIONAL WATER SUPPLY PLAN AND ADOPTION PROCESS

Date: August 31, 1995 Presented By: Rosemary Furfey

PURPOSE OF INFORMATIONAL BRIEFING

The purpose of this informational briefing is to: 1) present a brief summary of the newly-issued preliminary Regional Water Supply Plan (RWSP) and answer any questions regarding the plan; and 2) present the RWSP's adoption schedule and public involvement activities.

BACKGROUND

The preliminary RWSP (see Attachments 1 and 2) is the result of a five-year regional planning effort that has involved twenty-seven municipal water providers (cities and districts), together with Metro, in the three-county metropolitan region. The plan resulting from this unique multi-agency and inter-disciplinary program provides strategies for:

- cooperative regional conservation programs;
- efficient and flexible transmission systems;
- coordinated development of new supply sources; and
- options for institutional arrangements for providing municipal water service throughout the region.

The Metro Charter mandates that Metro adopt elements of the Regional Framework Plan that address regional water supply and storage, particularly as they relate to growth management. In addition, as the Region 2040 project progressed, it became clear that there was a need for coordination between Region 2040 growth planning and the demand forecasting being conducted by the Regional Water Supply Planning Study (RWSPS).

In order to facilitate coordination between these two major regional planning efforts, and to prepare for eventual adoption of water supply elements in the Regional Framework Plan, Metro formally joined the RWSPS effort on July 28, 1994 with adoption of Resolution No. 94-2010A. In addition, the Metro Council also authorized the transfer of Region 2040 population data to the RWSPS so that water demand scenarios could be modeled based on Metro's population growth projections. The data transfer was authorized by Metro Council resolution No. 1962A and the data transfer was completed during the summer of 1994. In addition, Metro Data Resources Center produced maps for several RWSPS technical reports.

When Metro formally joined the RWSPS, it appointed Planning Department Director Andy Cotugno as Metro's representative to the project. Since then staff have attended the study's steering committee and participant committee meetings as the preliminary plan was developed.

resources and future drinking water options. It is imperative that a broad-based, comprehensive and regional public education strategy be initiated as one of the first steps in implementing the region's water supply plan. Finally, this study highlights the need to ensure water supplies for in stream uses as well as coordinating all out-of-stream water uses (e.g., irrigation, industrial, water supply and hydro-power) on a comprehensive watershed basis to ensure the protection of water resources for the future.

1. **The Regional Water Supply Study has identified policy values. Which of these key policy values are most important to you in meeting your future water needs? Are there other policy values that are equally or more important to you, if so what are they?**

   In September 1994, the Metro Council Planning Committee reviewed the study's draft policy objectives and provided specific comments to the study's steering committee regarding Metro's policy interests in a letter dated October 20, 1994. The policy issues of highest concern identified by the Metro Council are:

   Efficient Use of Water

   The Metro Council strongly supports the efficient use of water resources with particular emphasis on water conservation and making the best use of existing supplies. It also stated its support for the current effort to investigate the potential efficiencies gained by the selective reuse of wastewater.

   Reliability

   The Metro Council believes the issue of planning for curtailment during drought should be addressed. It encouraged the study's steering committee to examine the cost of continuing to provide water with high reliability versus curtailment of use during periods of drought. The Metro Council believes that the public should be educated and involved in managing demand and that higher reliability can be obtained through different strategies (e.g., conservation).

   Water Quality

   The Metro Council strongly supports watershed protection to enhance and protect water quality and ensure future water quality. In addition, it wants to stress the need to protect and ensure high water quality standards while ensuring the ability to mix water sources across the region.

   The Metro Council wants to add that it is equally important to ensure surface water quality is protected after water supply needs are met, rather than only considering raw water quality for drinking purposes. The plan should avoid surface water quality degradation before and after water withdrawals.

   Environmental Impacts

   The Metro Council emphasizes the need to avoid environmental impacts, not just to minimize or mitigate them. These impacts must be evaluated on a watershed basis in order to characterize the cumulative and downstream impacts of water supply facility development and operation. This includes evaluation of impacts on adjacent as well as watershed-wide land uses and natural resources. Metro will evaluate any supply planning option from an integrated multi-

objective viewpoint. This includes consideration of the multiple functions and benefits of fish and wildlife habitat, open space, natural areas and wetlands. Retention of natural systems should be a priority goal.

Growth

The Metro Council strongly supports the coordination between the water supply planning study and the Region 2040 project. In addition, the Metro Council emphasizes the need for continued active cooperation between Metro and the region's water providers to determine where future growth should occur. Future urban form and growth will have an impact on future water supply demands and opportunities for water efficiencies.

2. **Do you agree with the recommended strategies contained in the Preliminary Regional Water Supply Plan? If so, why? What strategies specifically do you not support and why?**

Overview of the Recommended Strategies

All five strategies address the range of policy issues of concern to the Metro Council. All five address reliability, water quality, environmental impacts and water efficiency (see Table X1-3, below). These strategies are flexible and adaptive to changing conditions, and can be reassessed at periodic intervals during implementation of the plan. The strategies include incentives for water conservation and land use controls to protect water quality and future source options. The importance of land use decisions is a critical factor in each strategy with regard to protecting groundwater, surface water quality and land use patterns that reduce water demand. The incremental nature of these strategies incorporate strong incentives for reducing environmental impacts and conserving water while implementing the plan. The five strategies allow the public to understand the range of policy options, the trade-offs with different supply sources and the phasing of different sources as demand changes over time or as new information becomes available about source options.

TABLE XI-3

Key Policy Objectives
Addressed by Level 1 Resource Sequences

Sequence	Natural Environment	Water Use Efficiency	Raw Water Quality	Costs	Catastrophic Events
1.1	✔	✔			
1.2		✔	✔		
1.3		✔	✔	✔	
1.4		✔			✔
1.5	✔	✔		✔	✔

The Metro Council strongly supports water conservation as the first action taken in each strategy, in conjunction with bringing on the currently committed base case sources. Water conservation should start immediately. It must be the cornerstone to any regional water supply strategy because it can delay the need to develop new sources, while putting off unavoidable environmental impacts and costly public works projects. Most importantly, this preliminary plan helps to identify the key research needs and questions that must be answered before future water supply options are initiated. This planning process must necessarily be iterative and the source options must be continually re-evaluated as new data and information become available.

Policy options and combination of sources in the five proposed strategies are reasonable. The five strategies allow the public to evaluate the trade-offs and implications of achieving different combinations of policy objectives. There are critical decision points in each strategy where water supply choices must be made. There are, however, many unresolved issues regarding each strategy. Research and aggressive water conservation programs are essential to meet the goals of whatever strategy is finally adopted.

Evaluation of the Recommended Strategy

The recommended strategy to meet the region's future drinking water needs is Sequence 1.5 as illustrated in Figure XI-6. These source options are: outdoor water conservation, aquifer storage and recovery (ASR), use of water in the Clackamas and Willamette Rivers and designated regional water transmission interconnections. These options must be considered in the context of naturally occurring conservation (mandated through legislation) and existing base case commitments.

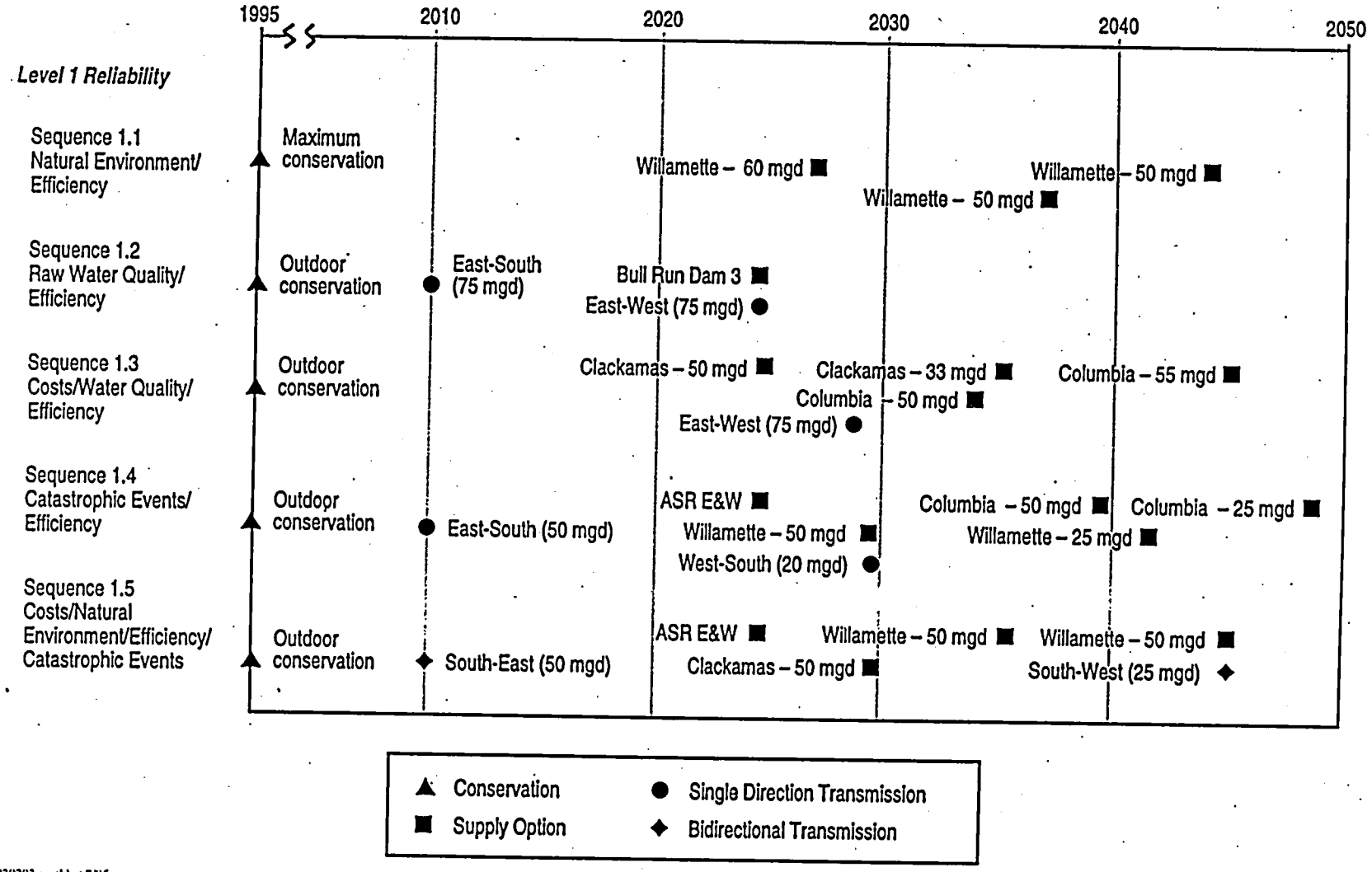
The recommended strategy has many advantages including: relatively low costs, relatively low environmental impacts, emphasis on water conservation, relatively low vulnerability to catastrophic events and flexibility to deal with future uncertainty. These advantages address many of the policy issues of concern to the Metro Council.

The Metro Council supports the selection of conservation as the first action to be taken to implement this strategy. It is recommended, however, that a cost effective mix of both indoor and outdoor conservation measures be implemented rather than just outdoor conservation. Conservation must be comprehensive rather than compartmentalized into different sectors (i.e. outdoor versus indoor). To avoid bringing future sources on line, this mix of conservation measures will have to be used eventually, and it is recommended to implement this most effective mix of conservation as soon as possible. Conservation must be seen as a long-term strategy that fundamentally changes human behavior and the public's understanding of how personal actions affect water supply and water quality. Based on Metro's success with regional solid waste recycling, staff believe there is tremendous potential for the public to similarly conserve water.

The Willamette River option is controversial. Public sentiment against the Willamette River option is a strong incentive for maximum conservation and land use planning to comprehensively protect and manage water quality in the watershed. There is public concern about the risk associated with varying levels of treatment technologies to treat raw water from the Willamette River. This concern was strongly expressed at the Metro public hearing regarding this preliminary plan. Metro Council and staff members share many of these

Figure XI–6

Level 1 Resource Sequences–High Demand



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FACTUAL ANALYSIS

Phase I

Prior to Metro joining this study, the planning work began in 1991 with three "Phase I" studies. These studies projected future regional water demand, evaluated potential water sources and identified ways to conserve water. It recommended more detailed study of conservation, transmission and system efficiency, and new supply sources. Options that could provide enough water to meet population growth during the next 50 years included: demand management; a third dam and reservoir on the Bull Run River; expanding the Barney Reservoir on the Trask River; increased treatment and use of the Clackamas River; new diversions and treatment on the Willamette and Columbia rivers; and aquifer storage and recovery.

Phase II

The currently completed "Phase II" work included more detailed studies of promising water sources and alternatives to help meet water demand in the years ahead. It has investigated how to make new and existing water systems more efficient and cost-effective through conservation and transmission.

The study used an integrated resources planning (IRP) process that examined a range of water resource options including supply, transmission and conservation. The IRP process designs and evaluates different resource combinations to determine their respective and relative costs, benefits, impacts and risks. This involves identifying the policy values which guide the study, formulating and evaluating the mix of resource options, communicating with citizens and decision makers, and presenting tradeoffs which must be weighed and balanced before an informed decision can be made.

The key planning elements included: 1) evaluation of conservation and demand management opportunities; 2) analysis of water supply source options; 3) analysis of system efficiency and transmission; 4) identification of different water service governance and institutional arrangements; and 5) public involvement through newsletters, media coverage, slide show and video, stakeholder interviews, focus groups, public forums, workshops and briefings for interested groups and decision makers.

The project consultants developed a computer model called "IRPlanner" to assist in generating and evaluating the scenarios. The model allows planners to set up different scenarios by specifying different sources, supply amounts, transmission routes, conservation efforts, and timelines to determine how various choices differ in terms of system reliability, efficiency costs, environmental impacts, and the ability to manage catastrophic events.

Results and Recommended Long Term Strategy

The preliminary plan identifies and investigates five approaches to meeting the region's water supply needs and achieving the highest level of reliability. Each of these five sequences emphasizes different policy objectives and combinations of objectives. Some of the key findings in the plan are: 1) a significant amount of water is available to the region; 2) supply facilities will be added to the existing supply base in the near-term (see Attachment 3). These include

EXHIBIT B

Attachment to Resolution 95-2233A

METRO ANSWERS TO QUESTIONS FOR PRELIMINARY REGIONAL WATER SUPPLY STUDY PARTICIPANTS

November 8, 1995

Introduction

The preliminary ***Regional Water Supply Plan*** is the culmination of a five-year multi-jurisdictional planning effort. The plan is comprehensive, regional in scope and far reaching in its technical analyses and recommendations. The Metro Council recognizes that water providers have shown exceptional leadership by organizing themselves and funding a regional water supply study that addresses issues that are vital to the future of the Portland metropolitan region. The study identifies specific policy objectives, investigates selected water source options and supply strategies. It identifies the trade-offs associated with each strategy and recommends a preferred strategy to meet future water supply demands. There are no easy answers to the questions of how to meet future water supply needs. Each strategy has positive and negative aspects. There are also many unknowns. For example, we will not know how much water citizens and industry can conserve until an aggressive regional water conservation programs are initiated. Most importantly, however, this planning effort is focusing public attention on water supply issues, stimulating public debate about source options and how water resources should be managed. This study is raising these issues to the important level it deserves.

Important Link with Region 2040 and Growth Management

The Metro Council strongly supports the regional scope of this plan and the regional nature of its proposed strategies. The ***Regional Water Supply Plan*** is being issued at a time when the citizens of this region are participating in Metro's Region 2040 project to determine how the region will grow in the next 50 years. The region's future urban form must complement and protect natural resources as the region grows. Water supply planning is a crucial part of this debate. Urban density, land use and growth patterns affect water demands and options for future sources. Urban form and land use will dictate near term and future infrastructure needs. One of the cornerstones of Region 2040 is resource conservation, therefore, water conservation must be the most important part of any source option strategy. Metro's land use decisions should complement and protect future water supply options. Metro has a responsibility and important role to play in these future decisions. Regional water supply planning and the Region 2040 growth management planning program must continue to be coordinated since it is critical to the future livability of this region.

Water Conservation and Public Education Are Essential for Any Future Water Supply Action

The scope and implications of this plan require an aggressive, regionally comprehensive public education and conservation program. The study's public opinion survey reveals that a significant portion of the respondents to the survey are unaware of their drinking water source or the implications for the sources being considered. This illustrates the need for public education to make citizens aware that their personal actions have direct implications on the region's water

ATTACHMENT 3

Near-term Strategies

- Completion of the Barney Reservoir
- Small expansions of existing Clackamas systems
- Remediation and maintenance of the Portland wellfielc
- Transmission and interconnection to areas facing immec
- Continued conservation
- Further study of potential non-potable sources including treated wastewater effluent and untreated groundwater and surface water
- Maintain the viability of supply options including:
  - Conduct water quality monitoring and pilot treatment testing
  - Participate in numerous state and federal studies relating to water quality and supply related issues
  - Participate in growing number of watershed related work
  - Conduct fishery studies (e.g., IFIM on ClackamasR.)
  - Acquire or protect land/right-of-way acquisition for facility sites.
  - Participate in Metro regional framework plan formulation and implementation
  - Participate in water rights adjudication in Willamette Basin.
  - Conduct pilot tests at potential ASR sites and participate in state rulemaking on ASR
  - Participate in wellhead protection rulemaking.

  <u>For Bull Run:</u>
  - Participate in implementation of President's NW Forest Plan;
  - Participate in Sandy Basin/Watershed activities;
  - Participate in Sandy Basin water rights adjudication;
  - Advocate protection of the Little Sandy Basin as optional municipal water supply if long-term storage on the Bull Run isn't available.

1. That the Metro Council recognizes the importance of the Regional Water Supply Planning Study, its link with the Metro's Region 2040 program and applauds the region's water providers for their leadership in conducting this study.

2. That the Metro Council has reviewed the preliminary Regional Water Supply Planning Study and has taken public testimony regarding the study. Based on this review, the Council has identified the following major recommendations as the study is refined:

- Implement comprehensive aggressive regional water conservation and water pricing as the cornerstone of any future regional water supply strategy;
- Investigate future source options such as dual systems, nonpotable water systems and water reuse;
- Maintain the regional scope of this study to ensure that all citizens in the Metro region are assured high water quality;
- Maintain regional flexibility and options for future water supply sources;
- Initiate a formal regional consortium of water providers and other participants to implement a regional water supply plan, especially with regard to water conservation;
- Recognize that this public review is only the beginning of a long process of public input into the development of future water supply options and Metro's Urban Water Supply element in the Regional Framework Plan.

3. That the Metro Council is sending the attached Exhibit B to the Study's consultant team and steering committee for ~~inclusion~~ consideration in preparing the draft final Regional Water Supply Plan.

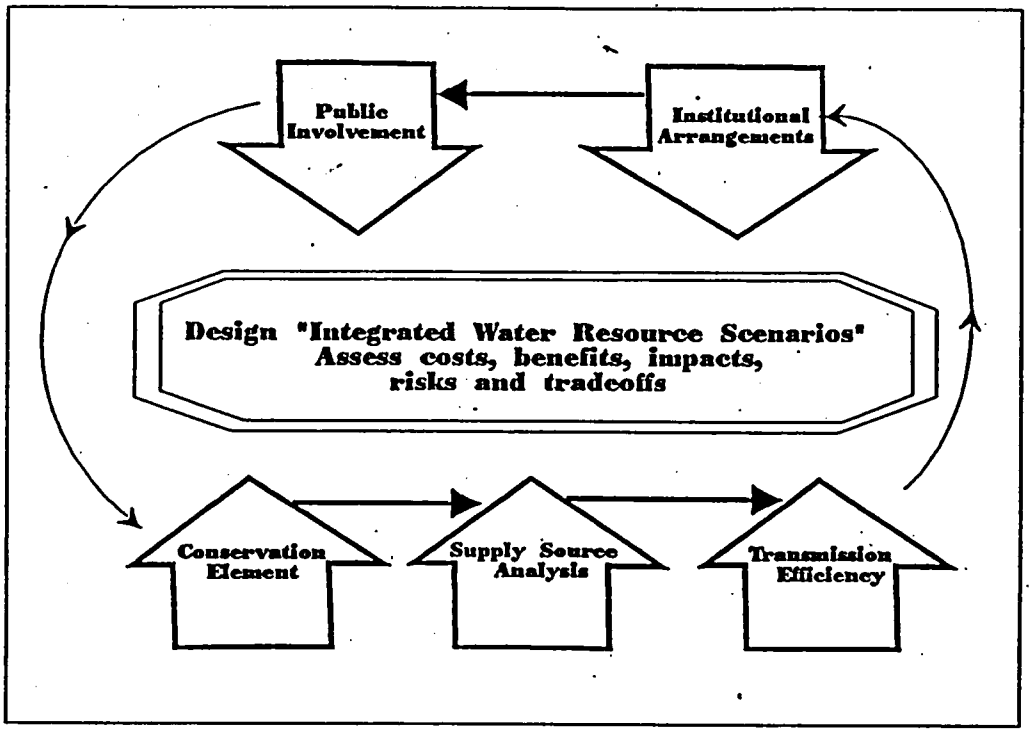
ADOPTED by the Metro Council this 16 day of Nov., 1995.

J. Ruth McFarland, Presiding Officer

Approved as to Form:

Daniel B. Cooper, General Counsel

Integrated Resources Planning Approach
Regional Water Supply Plan - Portland Metropolitan Area



What is the Regional Water Supply Plan?

Twenty-seven of the municipal water providers (cities and districts) in the Portland tri-county metropolitan area plus METRO, with the help of an inter-disciplinary team of consulting firms, are developing a long-range regional water supply plan.

Together, these agencies are funding and managing an *integrated resources planning* project to determine how future water needs can and should be met until the year 2050.

This unique level of interagency cooperation and joint project sponsorship will:

- Allow providers to maintain a broad, regional view of the issues
- Make the most efficient use of existing and future regional supplies
- Increase financial savings through the implementation of cooperative programs and projects
- Facilitate the evaluation of a range of supply and demand management alternatives

The plan will provide strategies for:

- Cooperative conservation programs
- Efficient and flexible transmission systems
- Coordinated development of new supply sources

- Options for institutional arrangements for providing municipal water service throughout the region

What is Integrated Resources Planning?

Integrated resources planning, or *IRP* , is a planning approach that involves examining a range of water resource options including supply, transmission, and conservation. The heart of the IRP process is the design and evaluation of different resource combinations to determine their respective and relative costs, benefits, impacts, and risks. Using this IRP approach, the providers are:

- Identifying policy values upfront to direct the formulation and evaluation of alternative mixes of resource options- Identifying complex issues up front
- Evaluating uncertainties explicitly
- Communicating with citizens and decisions makers
- Presenting the tradeoffs which must be weighed and balanced before making informed decisions

What are the Key Planning Elements?

Conservation and Demand Management Opportunities – including measures and programs that apply to indoor and outdoor uses of residential, commercial, industrial and institutional customers. Conservation measures under consideration include both voluntary and mandatory approaches.

Water Supply Source Options – including a third dam and reservoir in the Bull Run Watershed, expansion and/or consolidation of existing water systems on the Clackamas River, new diversions and treatment of the Columbia River, and a technique for optimizing the use of supply called Aquifer Storage and Recovery. Aquifer storage and recovery involves underground during the winter high flow months, and extracting it for future use during the summer. The approved Barney Reservoir expansion project, some limited expansion of intakes on the Clackamas, and full use of the Portland wellfield are presumed to be available to the region as part of the planning approach.

System Efficiency and Transmission – including the characterization of existing infrastructure and identification of sub-regional and regional strategies for transmission, treatment, pumping and terminal storage that link together both existing and potential future supply source.

Institutional Arrangements – including available options for water services governance and how they relate to the most promising resource combinations for the future.

Public Involvement is also a cornerstone of the planning effort. The integrated resources planning approach incorporates public values and priorities into the analysis process. To better understand public values in the region, project participants have undertaken a host activities to provide public information and offer opportunities for public participation in shaping the plan. Public involvement tools include:

- Newsletters
- Media coverage (newspapers, television)
- Slide show
- Video (available in July 1995)
- Stakeholder Interviews (1993)
- Focus Groups (1995)
- Public Attitude and Contingent Valuation Surveys (1993)
- Forums, Workshops and Briefings for interested citizens, organizations, and decision makers

The project participants have used public input and professional judgment to develop a range of *policy objectives* and evaluation criteria. The policy objectives are being used to design the integrated water supply scenarios. They also provide the basis for measurable

criteria which will be applied to evaluate the various resource combinations or scenarios (The most recent version of the policy objectives is attached.)

The project consultants also developed a computer model called *IRPlanner* to assist in generating and evaluating the scenarios. Model users can set up different "what if" scenarios by specifying different sources, supply amounts, transmission routes, conservation effort, and timelines to determine the how the various choices differ in terms of system reliability, efficiency costs, environmental impact, ability to manage catastrophic events, etc.

The Preliminary Regional Water Supply Plan is scheduled for completion in July of 1995. The Preliminary Plan will be circulated for public review and comment region-wide. There will be a number of opportunities for citizens and decision makers to offer their thoughts and suggestions on the plan during the summer and fall. From this input, the providers will develop a final plan and implementing strategies which will be presented to the region's decision makers for adoption by the end of the year.

What You Can Do

If you would like additional information about the integrated resource planning process and its role in the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Regional Water Supply Plan - Policy Objectives

- Used to help design integrated water resource scenarios.
- Provide a foundation for criteria with which to evaluate options and/or scenarios.
- Capture the diverse set of values and priorities in the region -- will help show *tradeoffs*.
- Some policy objectives may be complementary (e.g., maximize efficiency and environmental protection), while some may "compete" or "conflict" (e.g., minimize cost and maximize reliability).
- There is overlap between some objectives (e.g., reliability, flexibility, impacts of catastrophic events -- and the role of transmission).
- Each objective has one or more evaluation criterion.
- Policy objectives have been reviewed by participant decision making bodies.

Policy Objectives

Efficient Use of Water

- Maximize the efficient use of water resources, taking into account the potential for conservation, availability of supplies, practicality, and relative cost-effectiveness of the options.
- Make best use of available supplies before developing new ones.

Reliability

- Minimize the frequency of water shortages of any magnitude and duration.
- Ensure the ability to manage the duration and magnitude of shortages (e.g., through the operation of raw water storage facilities or through access to alternative sources of water).

Water Quality

- Meet or exceed all current and future federal and state water quality standards for finished water.
- Maximize the ability to protect water quality in the future, including the ability to use watershed-protection based approaches.
- Utilize sources with highest raw water quality.
- Maximize the ability to deal with aesthetic factors, such as taste, color, hardness, and odor.
- Ensure the ability to mix water sources across the region.

Impacts of Catastrophic Events

- Minimize the magnitude, frequency, and duration of service interruptions due to natural or human caused catastrophes, such as earthquakes, landslides, volcanic eruption, floods, spills, fires, sabotage, etc.

Economic Costs

- Minimize the economic impact of capital and operating costs of new water resources on customers.
- Assure the ability to relate the rate impacts associated with new water resources to the benefits gained within the region on an equitable basis over time.

Public Acceptability

- Maximize the acceptability of regional water resource strategies by meeting the needs of the public at large.
- Maximize the acceptability of regional water resource strategies by meeting the needs of stakeholders.
- Maximize the acceptability of regional water resource strategies by meeting the needs of elected officials, including the state legislature and Metro.

Institutional arrangements

- Ensure that feasible institutional arrangements exist or can be developed to implement the selected resource strategy(ies).

Environmental Impacts

- Minimize the impact of water resource development on the natural and human environments.

Growth

- Be consistent with Metro's regional growth strategy and local land use plans.

Flexibility to Deal with Future Uncertainty

- Maximize the ability to anticipate and respond to unforeseen future events or changes in forecasted trends.

Ease of Implementation

- Maximize the ability to address local, state, and federal legislative and regulatory requirements in a timely manner.

Operational Flexibility

- Maximize operational flexibility to best meet the needs of the region, including the ability to move water around the region and to rely, as necessary, on backup sources.

I HEREBY CERTIFY THAT THE FOREGOING IS A COMPLETE AND EXACT COPY OF THE ORIGINAL THEREOF.

Clerk of the Metro Council

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF PROVIDING COMMENTS ON THE PRELIMINARY REGIONAL WATER SUPPLY PLAN	)))	RESOLUTION NO. 95-2233A Councilor Susan McLain

WHEREAS, Metro is mandated by its Charter to address Regional Water Supply and Storage in its Regional Framework Plan; and

WHEREAS, Metro joined the Regional Water Supply Planning Study on July 28, 1994, with adoption of Resolution No. 94-2010A; and

WHEREAS, Metro provided Region 2040 project population projections to the Regional Water Supply Planning Study and other map and analytic services as its contribution to the study as agreed in Council Resolution No. 94-1962A; and

WHEREAS, Metro coordinates regional growth management planning through its Region 2040 program and the resulting urban form will affect water consumption demands and future water supply infrastructure needs in the region; and

WHEREAS, Metro is member of the Regional Water Supply Planning Study and is participating in the adoption process of the Regional Water Supply Plan, together with the other 27 sponsoring water districts and jurisdictions in the region; and

~~WHEREAS, Metro will eventually adopt the final Regional Water Supply Plan in early 1996 and use relevant parts of that plan as a basis of its Regional Water Supply and Storage element in the Metro Regional Framework Plan; now, therefore~~

WHEREAS, Metro Council has had a presentation and staff report on the preliminary Water Supply Plan (see Exhibit A) and that Metro does not accept or adopt the preliminary Water Supply Plan in its current form, now, therefore

BE IT RESOLVED,

concerns and questions. The Metro Council, however, recognizes the need to maintain a regional perspective when evaluating future source options. The Metro Council, therefore, recommends aggressively pursuing the most cost effective water conservation and water pricing, other nonpotable source options, and re-evaluating lower reliability in order to maximize existing sources. The Metro Council requests that this scenario be analyzed and evaluated in the next phase of plan revision. This scenario should be fully utilized before consideration of future new regional water sources.

The Oregon Department of Environmental Quality's (DEQ) recent report entitled ***Willamette River Basin Water Quality Study*** identifies the Willamette River watershed as imperiled by environmental deterioration if action is not taken now to reverse current water quality and land use trends. There is clearly a need to take action to improve water quality in the Willamette River to protect and enhance all its beneficial uses and functions. The Metro Council strongly supports the formation of a watershed-wide effort to manage and protect the Willamette River.

Ultimately, the public must decide how much risk it is willing to accept regarding potential health affects of using the Willamette River as a source of drinking water. According to the recommended strategy, however, the Willamette River would not be used until after 2035, thereby allowing research to be conducted to better understand the water quality of the Willamette River and how it can be treated most effectively. In addition, a watershed land use action plan must be developed and implemented to protect and enhance the river's water quality. Citizens, industry and agricultural land mangers will have to change their current practices and personal actions in order to improve water quality.

Aquifer storage and recovery is another component of the recommended strategy which raises several unanswered questions. For example, this strategy has not been fully tested in Oregon, particularly in the three-country metropolitan region. New laws are only now being promulgated to regulate aquifer storage and recovery. The issue of how existing and future land uses (e.g., intensive agriculture in the aquifer storage and recovery (ASR)-designated areas) will affect water stored in aquifers needs to be investigated. In addition, how will stored drinking water be protected from unauthorized uses or co-mingling with other groundwater which may be contaminated? How is the zone of influence of the injected water determined to identify if water is being withdrawn for unauthorized uses? What are the impacts of increased withdrawals? These questions highlight the need to ensure that land use controls and wellhead protection programs are in place before ASR is implemented. The Metro Council urges that these key research questions must be identified and action taken to protect future ASR lands.

The recommended strategy also includes withdrawal on the Clackamas River. Metro staff have several concerns about this option. The Clackamas River's cold water fishery is significant in the Pacific Northwest. The watershed is experiencing rapid growth pressures as well as projected future growth based on the Region 2040 project. It is recommended that an instream flow incremental methodology (IFIM) study be conducted as soon as possible before additional withdrawals are initiated on the Clackamas River to investigate key questions about the Clackamas fishery and other questions regarding in-stream priorities. Land use that protects water resources is essential. There is also an opportunity to manage large portions of the upper watershed which is in federal land ownership. It is, therefore, critical that all jurisdictions, including Metro, coordinate their actions to achieve resource protection goals in the Clackamas watershed.

Comments on Other Strategies

Strategy 1.2 includes the construction of a third dam on the Bull Run River. The Metro Council has many concerns and questions about pursuing this option. A third dam will have significant impact on in-stream flows and aquatic resources within the watershed. Because this dam will be higher in the watershed, it can be assumed to have higher proportional damage to aquatic and terrestrial systems, therefore, the Metro Council does not fully support this option at this time for the following reasons: 1) the dam will have high, and as yet not fully determined, environmental impacts; 2) there is high risk related to catastrophic impacts; 3) there would be impacts to old growth habitat; 4) there is high uncertainty of regulatory permitting within the context of the Clinton Forest Plan; and 5) it serves as a disincentive for water conservation by making a large volume of high quality water available.

The preliminary plan does not identify the downstream impacts on recreation (e.g., on the Sandy River) that would be caused by the third dam. In addition, the plan states that the Oregon Water Resources Department has established "Diack" flows on the Sandy River to meet the objectives of the State Scenic Waterway legislation. In fact, these flows are often not met during most months. This also highlights the connection between consumption of Bull Run water and its direct effect on the declining salmon in the Sandy River.

The Metro Council also believes the Bull Run option is more restrictive and limits the flexibility of the planning process. Once it is determined to pursue the Bull Run dam option, other options and flexibility about future water sources are eliminated. One does not build one-half a dam. The option of a third dam also takes away the responsibility for regional watershed planning and land use controls to protect future water supply sources. It also takes away the public incentive to conserve water in order to avoid using future water sources. If the public knows that the Bull Run is planned for the future, what incentive is there to conserve water? In fact, this may cause water conservation targets not to be met and the dam may have to be built sooner than scheduled.

3. What changes would you recommend for consideration in the final RWSP? Why?

Water Conservation

The range of conservation technologies and strategies analyzed in this report is impressive. The assumptions for projected water savings appear to be realistic, yet it is impossible to know if these savings can be achieved until actual field or pilot testing is conducted. One additional measure that is recommended for consideration is lodging industry showerhead replacements. Based on the number of hotel rooms in the Portland metropolitan area and the high output volume of showerheads in use in the Portland lodging industry, this conservation measure could significantly reduce summertime peak day demand.

The preliminary plan groups conservation measures by sector and in three levels or "bundles." In reviewing these measures, it is recommended to move several of the conservation measures from Level III to Level II. For example, when a water audit is conducted in Level II, it would make sense to include ultra low flush (ULF) toilet rebates at the same time. Customers want to know all the measures which can help them save water. If ULF rebates are included in the water audit program, auditors can verify the need for ULF toilets and inform customers of their availability at the time of the audit. It would be relatively easy to include this measure in

Level II programs and less expensive then trying to return to these customers later with the hopes that they will install ULF toilets. Water audits should be geared toward helping the customer save water in every cost effective way. Customers are interested in all measures which help them save water and all measures should be included in the original audit performed for that customer.

Another measure that is recommended to be moved to Level II from Level III is landscape ordinances. Ordinances can be relatively inexpensive to implement and can result in substantial water savings if they are combined with existing inspection and enforcement actions. Ordinances can also be inexpensively adopted to establish maximum turf requirements for commercial and industrial sites throughout the region, therefore, it is recommended that it be included in Level II. Given the importance of conservation measures to this plan and the extensive marketing and public education that will be needed to achieve the plan's targets, it makes sense to combine Level II and Level III in a more aggressive conservation strategy.

Successful implementation of the conservation component and achieving or surpassing projected water savings will depend on a well-coordinated comprehensive regional strategy. This must include extensive public education, aggressive marketing to all customer classes, regional pilot programs designed to test incentive levels, participation rates, water savings, customer acceptance and all the other unknown variables inherent in a new program of this scope and magnitude. The Metro Council recognizes that conservation is not easy to implement and it certainly is not free, however, it is clearly less expensive than the alternatives. It is such an important component of this plan, however, that it must be approached as aggressively and seriously as possible. Metro has extensive experience in successful resource conservation and public education through its solid waste recycling programs. There are many parallels that can be drawn between promoting recycling and achieving regional recycling goals and promoting water conservation. Based on Metro's charter mandates, this is an important role Metro should undertake as the plan is implemented. Specific recommendations will be described in the answer to question No. 4.

Finally, in order to maximize the full potential water savings from a conservation program and recognizing its critical role conservation plays in all future water source decisions, the Metro Council recommends that each strategy include a mix of the most cost effective conservation measures, both indoor and outdoor. Currently, only Strategy 1.1 includes maximum conservation and all the others include only outdoor conservation. One of the main reasons for advocating this mix of conservation measures is that the conservation program must look at all customer water use and help them reduce water use in all possible ways and reduce their total water bills. Promoting only outdoor conservation may not gain total customer commitment and may send a message to customers that the water conservation strategy is not comprehensive.

Aquifer Storage and Recovery

Several issues have already been raised regarding aquifer storage and recovery (ASR). These include: 1) contamination of stored water by adjacent land uses; 2) contamination of stored drinking water by contaminated groundwater; 3) contamination of existing groundwater with treated drinking water; 4) impact of future urban growth boundary changes and land use in urban reserves; 5) surface water impacts due to injected groundwater; and 6) unauthorized withdrawal of groundwater for adjacent land use activities.

ASR has not been adequately tested in Oregon, though it is being used in other parts of the country. The ASR pilot testing that is occurring in Salem needs to be closely monitored. Identification of research needs and pilot testing in the Portland region needs to be initiated immediately. The experiences of municipalities around the country with ASR must also be investigated. The Metro Council recommends that these research questions be investigated as soon as possible when implementing a regional water supply plan.

Regional Water Pricing

Conservation programs must be linked to conservation pricing policies across the region. Regionwide water pricing must be implemented if water conservation is going to be successful. Price signals must be put in place as soon as an aggressive water conservation program is initiated. The price structure will encourage conservation program participation and conservation programs can help customers lower their bills. If new rates cause higher bills, which in turn spur conservation program participation, reducing water bills, a clear path has been established for a successful demand side water management program. The Metro Council supports the water pricing recommendations made in the preliminary plan.

Several providers in the region have already implemented some form of conservation pricing. It is recommended that all providers in the region implement an aggressive conservation rate program, monitor its impact and adjust rates to maximize as large a water savings as possible. This issue needs considerable follow-up to coordinate, design and implement a regional pricing system.

Wastewater Reuse and Nonpotable Options

The Metro Council agrees with the plan's conclusion that there are potential markets for cost-effective wastewater reuse and nonpotable options. The Metro Council recommends that further investigation focus on institutional level reuse, rather than residential or business level development. This has the potential of being a very cost effective substitute for additional sources being brought on line. The Metro Council recommends additional investigation and public education about the advantages of wastewater reuse. Public information should include data about experiences of wastewater reuse in other parts of the country, particularly California.

High Technology Water Demands

The recent publicity about the water requirements of new high technology firms in the region has focused attention on this sector of the economy that can have a significant impact on regional and subregional water demands. The Metro Council recommends that this issue be closely monitored and the results factored into the water demand calculations as the plan is periodically updated. An aggressive industrial water reuse and conservation program must be implemented and monitored throughout the region.

Financing Recommendations

The Metro Council recognizes that the preliminary plan seeks to gain consensus about regional water supply strategies, rather than addressing implementation issues. The issue of how to finance implementation of the plan has raised many questions. The Metro Council recommends

that the draft final plan identify a basic financing strategy or polices that will guide future financing decisions. Metro is addressing this issue with regard to who will pay for future growth. Local jurisdictions participating in this regional water supply planning study as well as Region 2040 will want guidance and policy directives that identify how financing will be dealt with in the future and who will bear the costs of future development.

The final plan should also address the issue of how to deal with lost revenues to water districts due to successful water conservation programs.

4. **Do you support the concept of forming a formal consortium of water providers through the adoption of an intergovernmental agreement when the final RWSP is adopted? What types of functions do you think the region's water providers should carry out in a cooperative approach? If you do not support a formal organization how would you recommend that these functions be carried out?**

The Metro Council strongly supports the formation of a formal consortium of water providers when the final RWSP is adopted. The Metro Council recommends that Metro be a full member of this consortium with specific tasks and responsibilities to implement the adopted plan. It may also be advantageous to have other entities, agencies and organizations as members of the consortium to facilitate implementation of the plan based on the plan's adopted strategy.

Formation and Functions of a Consortium

The Metro Council recommends that the functions of this proposed regional water provider consortium include, but not be limited to, the following:

a. setting benchmarks and interim targets to monitor and measure implementation of the plan;
b. coordinating with other agencies, organizations and jurisdictions on all aspects of plan implementation;
c. conducting formal periodic reviews of plan implementation every five years and reporting on progress in achieving the goals of each aspect of the plan (i.e., are regional water conservation targets being met?);
d. identifying interim measures to achieve plan goals based on the results of plan implementation review;
e. sharing information among providers and participants in the consortium;
f. coordinating regional water conservation activities, monitoring progress and revising programs based on pilot testing results;
g. developing and coordinating an aggressive public education campaign regarding all aspects of plan implementation. Keeping public informed about how targets are being met or not met, identifying new strategies to meet conservation targets and ensuring a regionally comprehensive education program;
h. monitoring base case implementation;
i. seeking funding for and coordinate different research projects with relevant agencies/ jurisdictions;
j. identifying financing options for each stage of plan implementation;
k. coordinating with Metro Region 2040 project; and
l. conducting pilot testing of aquifer storage and recovery.

The Metro Council recommends that Metro identify its preliminary role in implementing the plan. This role should evolve over time and continually be evaluated in the context of Region 2040 implementation.

Proposed Metro Role and Responsibilities

Based on Metro's Charter mandate to address regional water supply and storage in its Regional Framework Plan, and based on the fact that water conservation is the first major program to be implemented in each strategy, the Metro Council recommends two roles for Metro in implementing the plan:

a. **Water Conservation and Public Education**

Metro should actively participate and take leadership in the coordination of regional water conservation and public education programs to aggressively achieve water conservation targets outlined in the plan. For example, Metro can expand its highly successful Metro Recycling Hotline to include information about water conservation and refer the public to local water providers and landscape architects. The Metro hotline responded to over 87,000 calls last year. In fact, during the 1992 drought, the hotline received many calls inquiring about water conservation measures. In addition, Metro has extensive experience in public education workshops, working with industry and other regional strategies to achieve resource conservation goals.

b. **Land Use**

Metro should use its land use authority in coordination with local jurisdictions to implement regulations, standards, model codes and incentives for land use, building code and landscaping ordinances to achieve the goals of the ***Regional Water Supply Plan***. Metro should support and encourage watershed planning, wellhead protection and research to address any of the outstanding issues in plan implementation. Metro should also coordinate acquisition of regional Greenspaces with implementation of the water supply plan to ensure compatible land uses and to avoid conflicting land uses wherever possible. Region 2040 land use should also be compatible with and support implementation of the adopted plan.

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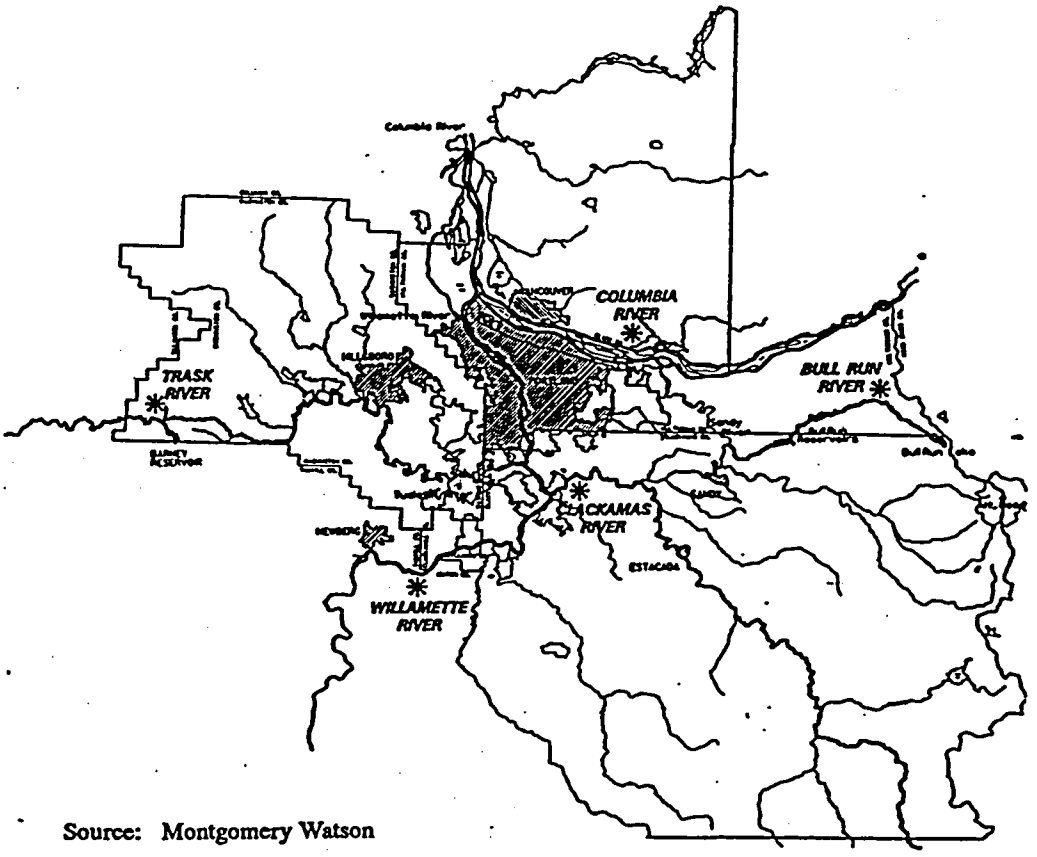
Existing Water Supplies
Regional Water Supply Plan - Portland Metropolitan Area



Source: Montgomery Watson

What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland Metropolitan area along with Metro are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. An important place to begin is the storage and delivery capacity of the existing water supply systems.

Existing Water Supply

The metropolitan region contains an intricate web of water supply systems, one that has evolved over the past century. It is a combination of run-of-river intakes, surface water storage, groundwater, water treatment plants, and a host of pipes, pumps and tanks used to convey the water. The supply sources function on regional, sub-regional and local levels. A few entities supply the water, and many others purchase the water wholesale and then distribute it throughout their service areas.

Existing water supply systems have a

maximum reliable storage capacity of 11.4 billion gallons and a delivery capacity of 413.8 million gallons on a peak day (mgd). Current peak day regional demand is about 370 mgd.

Current Sources

The Bull Run Watershed - For over one hundred years, the Bull Run Watershed has been supplying water to the region. Delivering some of the highest-quality raw water in the world, Bull Run water has never violated any of the federal or state water quality standards. It is one of the few surface water systems exempted from filtration. The two reservoirs located in the watershed can store over 10 billion gallons and deliver up 210 mgd. Water is supplied to reservoirs at Powell Butte, Mt. Tabor Park, Washington Park and numerous tanks for in-town storage.

The Clackamas River - Three suppliers can deliver up to 66 mgd to the southern part of the metro region. The Clackamas Water District has a peak delivery capacity of 30 mgd. The South Fork Water Board, serving both Oregon City and West Linn, has a peak delivery capacity of 20 mgd. And Lake Oswego can deliver up to 16 mgd.

The Trask/Tualatin System - Water that supplies the Joint Water Commission - the cities of Hillsboro, Beaverton, and Forest Grove - comes from both the Trask River (with storage in Barney Reservoir) and Tualatin River (including storage in Hagg Lake.) The peak delivery capacity from the JWC treatment plants is 43.5 mgd, and up to 1.2 billion gallons can be stored.

Columbia South Shore Wellfield - Current usable capacity of the wellfield is about 35 mgd. Use of full capacity up to 90 mgd is currently restricted to reduce the risk of influencing groundwater contamination from nearby sites.

Local Sources - Local sources in the three counties of the Portland metropolitan area supply up to 60 mgd, coming from small surface and groundwater sources. Few additional small resources are committed in the local area at this time.

Transmission - Numerous pipes, pump stations and storage facilities are located throughout the region. These facilities move the region's water supplies to where they are needed, when they are needed. Large lines include the Bull Run conduits, the Washington County Supply line, and the Southeast Supply Line. There are also numerous interties that allow water to be conveyed between systems.

Committed Sources

The attached table presents the different supply sources used today, listing the maximum reliable delivery and storage capacity of each source. It also lists the delivery and storage capacities of new or expanded sources that are already committed to be developed. For the purposes of this plan, these committed resources are assumed to come on line within two to ten years. So as the participants are developing different water supply options for the future, both the current and committed resources provide the baseline for existing supply capacity. The committed sources will increase delivery capacity by about 80 mgd and storage capacity by over 5 billion gallons.

The Clackamas River - Along the Clackamas, the South Fork Water Board and the City of Lake Oswego will expand their river intakes by 10 and 4 mgd, respectively. The Oak Lodge Water District is committed to providing new supply up to 8.5 mgd. In sum, these new resources will supply an additional 22.5 mgd from the Clackamas River.

The Trask/Tualatin System - The Barney Reservoir will be expanded to deliver an

additional 20 mgd and store over 5 more billion gallons.

Columbia South Shore Wellfield - The Portland wellfield will be able to provide an additional 37 mgd as a result of an aggressive remediation program and ongoing maintenance of the system.

What You Can Do

If you would like additional information on the existing water supply system in the Portland Metropolitan Region and how it fits into the Regional Water Supply Plan, please contact your local water provider or the project management staff at 823-7528.

Information Sources

Portland Water Bureau, *The Bullrun Dispatch*, January 2, 1995.

Barakat & Chamberlin, *Regional Water Supply Plan: Existing and Committed Supply Sources Table*, May 1995.

Personal communication with local water providers in March, 1995.

Montgomery Watson, *Review of Existing Information and Assumptions: Source Options Analysis Element*, August 1993.

REGIONAL WATER SUPPLY PLAN

EXISTING AND COMMITTED SUPPLY SOURCES

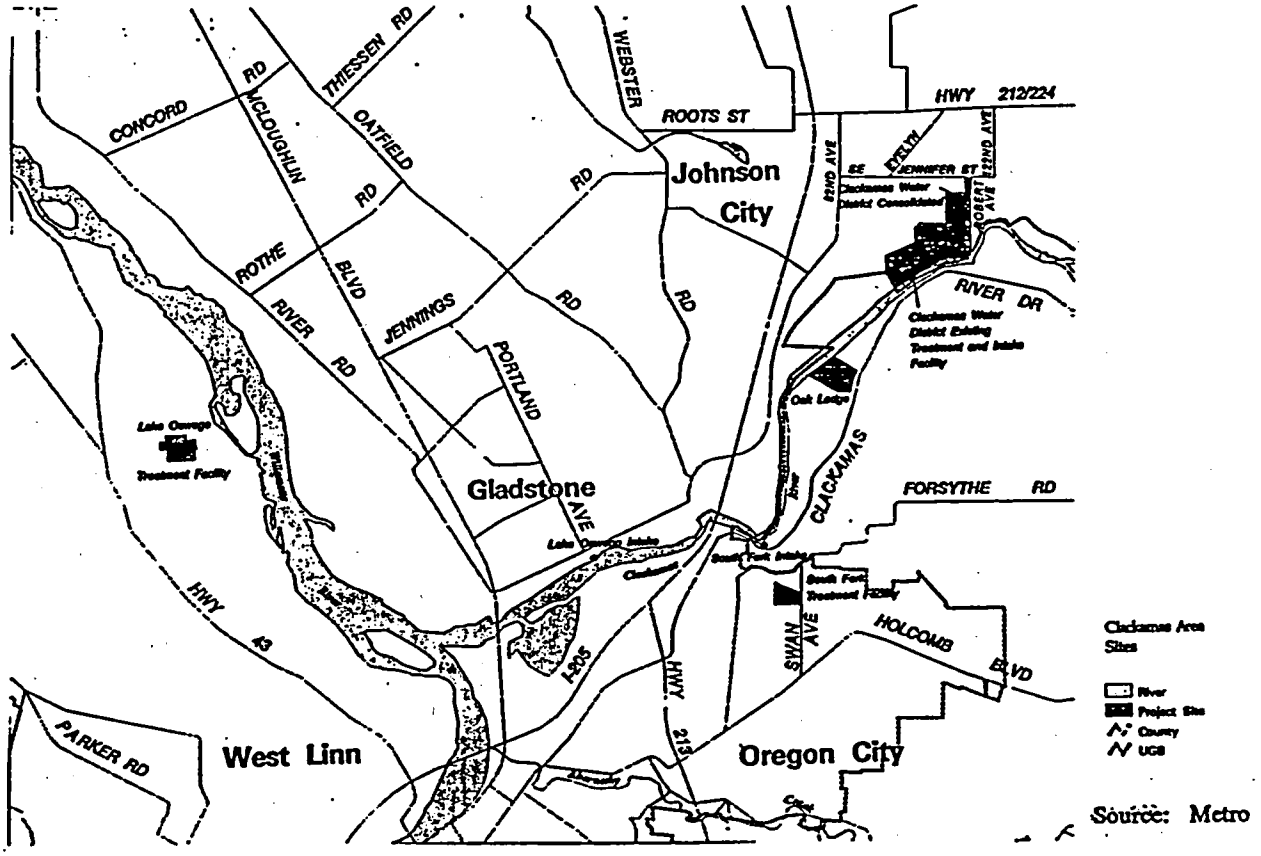
	EXISTING		ADDITIONAL COMMITTED		EXISTING & COMMITTED	
	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)
Bull Run Res 1,2	210	10200			210	10200
Clackamas						
CWD	30				30	
SFWB	20		10		30	
Lake Oswego	16		4		20	
Oak Lodge			6.5		8.5	
Subtotal		66		22.5		88.5
Trask/Tualatin	43.5	1153	20	5214	63.5	6367
Southshore Wellfield	35		37		72	
Local Sources						
South	28.4				28.4	
West	12.8				12.8	
East	18.1				18.1	
Subtotal		59.3				59.3
TOTAL	413.8	11353	79.5	5214	493.3	16567

BARAKAT & CHAMBERLIN

LOCAL WATER SUPPLY SOURCES

<u>East Node</u>		
Fairview	2.7	GW
Interlachen	1.3	GW
Powell Valley	1.8	GW
Troutdale	6.4	GW
Wood Village	1.4	GW
Portland	4.5	GW (former Parkrose wells not part of the Portland wellfield totals)
TOTAL	18.1 mgd	
<u>West Node</u>		
Forest Grove	1.3	Clear Crk. summer
North Plains	1.1	GW
Sherwood	2.8	GW
Tigard	1.1	GW
TVWD	3.0	GW
Cornelius/Gaston/Hill.	3.5	Haines Falls TP
TOTAL	12.8 mgd	
<u>South Node</u>		
Sandy	2.5	Alder Crk.& Brown Sp. 1996 cap.
Canby	6.0	Molalla R., wells, & springs 1996 cap
Boring	1.0	GW - actual production 1995
Damascus	3.3	GW
Lake Oswego	.3	GW
Milwaukie	6.7	GW
River Grove	1.3	GW
Wilsonville	6.0	GW
Skylands/G. Morie	.3	GW
Estacada	1.0	Clackamas River
TOTAL	28.4 mgd	
GRAND TOTAL	59.3 mgd	

Clackamas River Source Option
Regional Water Supply Plan - Portland Metropolitan Area



What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. One of the source options under consideration is expansion and/or consolidation of existing supply systems on the Clackamas River. An overview of key issues associated with the Clackamas option is provided below.

Existing Water Supply Uses

The Clackamas River currently provides municipal water supply to about 175,000 residents within the regional water supply plan study area. Clackamas water system capacity within the planning area is about 66 million gallons per day (gpd).Water is diverted and treated to meet drinking water standards by the City of Lake Oswego, Clackamas River Water district (formerly the Clackamas Water District), and the South Fork Water Board (which serves the cities of Oregon City and West Linn).

Upstream, water from the Clackamas River also supplies the City of Estacada. In addition, several Portland General Electric facitilities are operated for hydropower production.

Water Availability and Water Rights

Municipalities hold water rights to use 265 cubic feet per second (cfs) or 171 million gallons per day (mgd) on the Clackamas River. Only 66 mgd of capacity has been developed to date. The remainder could be developed to meet future growth in demand.

For purposes of the Regional Water Supply Plan, about 22.5 mgd of additional Clackamas River supply is scheduled for development in the near-term. Over an above these "committed resources," up to 83 mgd of additional supply is under consideration as part of the Regional Water Supply Planning project. This is about the maximum additional supply that could be developed under existing water rights.

Potential Uses and Facilities

Several new or expanded Clackamas River water supply facilities are planned to be completed by 2000. As mentioned above, a total of 22.5 mgd from these projects are included in the baseline capacity assumptions for the regional plan. Near-term capacity increases include 8.5 mgd from a new Oak Lodge Water District intake and treatment plant, 10 mgd from an expansion of the South Fork Water District facility, and 4 mgd from an expansion of the Lake Oswego facility.

Aside from the near-term expansions described above, the region's water providers are evaluating additional expansion of existing diversions and treatment plants, along with the potential consolidation of facilities at a single site.

Under consideration are alternatives to expand the Oak Lodge Water District facility by 8.5 mgd, the South Fork Water Board Facility by 10 mgd, the Clackamas River Water facility by 50 mgd, and the City of Lake Oswego facility by 18 mgd.

Consolidation of facilities could involve maintaining or phasing out existing intakes and treatment plants, and consolidating new facilities at one site. The representative site being considered for consolidation is located adjacent to the existing Clackamas Water District water intake and treatment facility.

Regional storage is also anticipated in conjunction with expansion of the Clackamas River supply system. The representative site for a regional storage reservoir is located on Forsythe Road. The site is generally located on a topographical bench area near the community of Outlook. A regional transmission line would be needed to connect Clackamas water treatment plants to the regional storage facility.

Water Quality and Treatment

The quality of the Clackamas River raw water is generally good compared with other regional source options, and very good compared with sources nationwide. The river has a low incidence

of natural and human-caused contaminants. There are some constituents that exceed drinking water standards including turbidity and microorganisms. Sporadic nutrient (e.g., nitrogen, phosphorus) increases can occur during low-flow periods causing taste and odor problems. The water is easily treated to meet drinking water standards.

The upper Clackamas watershed is largely in forest use while the lower watershed contains diverse land uses and is experiencing rapid population growth. From the headwaters of the Clackamas River to Carver Bridge is a designated State Scenic Waterway. Although these areas are upstream from municipal intake sites under consideration, these special designations afford opportunities to institute watershed protection measures designed to protect water quality. There are few discharges to the river upstream from intake sites under consideration. The lower basin contains diverse land uses and is growing rapidly. There is growing interest among citizens and agencies in watershed management opportunities for the Clackamas basin.

Currently, existing water purveyors filter and chlorinate water from the Clackamas river. This process has been effective in producing high-quality potable water that surpasses all safe drinking water standards.

For purposes of the regional water supply plan, it has been recommended to the project participants that future treatment replicate existing conventional treatment of sedimentation and filtration with the use of granular activated carbon for filtration. The use of granular activated carbon would provide a barrier against microbial and organic constituents in the water.

Key Environmental Issues

Fish - Development of additional water supplies on the Clackamas River could affect fish populations. Adverse impacts can occur due to flow changes and if fish get trapped, injured, or killed at the intake facilities. Some of the intake sites appear to present more risk of impacts to fish than others. However, an instream flow incremental methodology (IFIM) study is recommended to characterize fish habitat and better ascertain the impacts on fish and fish habitat associated with one or more intakes on the river. Fish impacts can be avoided or mitigated through intake design, appropriate fish screening, and reducing diversion sizes.

Wetlands - Expansion of Clackamas River water supplies is expected to minimal to no impacts on wetlands. Construction of supply facilities at the representative site for a consolidated facility could avoid on-site wetlands. Impacts to wetlands due to expansions on existing facility sites are expected to be minor. Impacts can be mitigated by minimizing site disturbance and providing enhancement of nearby riparian areas and wetlands. Flow changes are not expected to affect downstream wetlands, however, ongoing assessment of the impact of flow reductions on downstream floodplain wetlands is recommended.

Recreation - Facility siting and additional diversions on the Clackamas River could have an adverse impact on instream recreation opportunities. Potential impacts could be mitigated through facility design and signage, along with the possible establishment of riverside trails.

Land Use - Expansion and consolidation of facilities are generally consistent with local comprehensive plans. Expansion of the Lake Oswego intake facility would require an amendment to the City of Gladstone zoning code to allow the facility as a conditional use in an Open Space zone.

Costs

Costs of the project include both capital costs for design and construction, as well as ongoing varible costs to operate and maintain the facilities.

The capital costs of expanding system capacity on the Clackamas River are estimated to be about $157 million for a 50 mgd facility. A 75 mgd facility would cost about $87 million. These costs are based on an assumption that expansions would take place in a consolidated fashion on the representative site adjacent to the existing Clackamas River Water facility. They include costs for a river intake and raw water pumping station, treatment plant and finished water pumping station, a transmission line and regional storage. In addition, power and chemical costs are projected to be about $148 and $25 per million gallons, respectively. (Note: Variable costs may be subject to revision.)

Putting the Pieces Together

The Clackamas River option will be evaluated, along with water conservation programs and other supply sources. The evaluation will involved comparing how well different resource combinations meet objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how the Clackamas River fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

From the list of reports produced for the Regional Water Supply Plan project:

Murray Smith and Associates, *Evaluation of Water Rights and Water Use Permitting Requirements,* March 10, 1994.

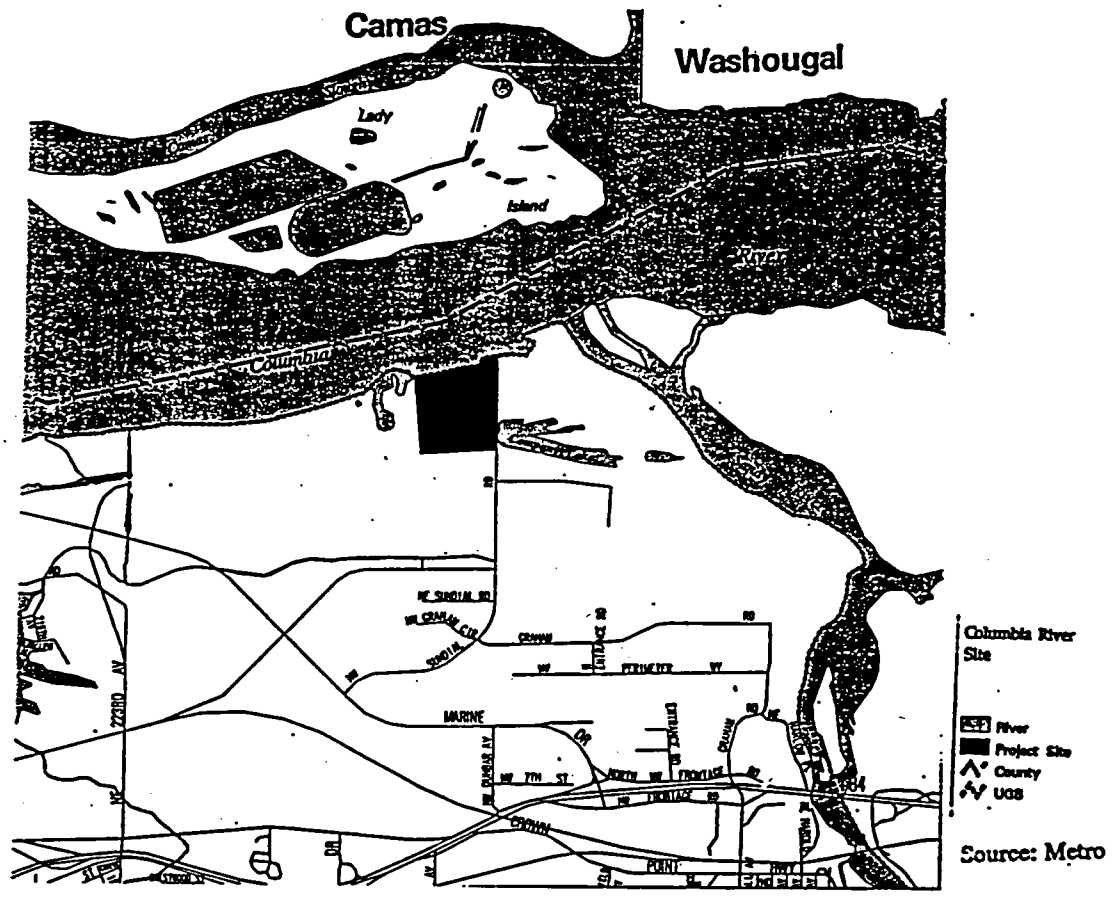
Montgomery Watson, *Water Quality Analysis,* February 1994.

Montgomery Watson, *Water Treatment Analysis, May 1994.*

Montgomery Watson, *Surface Water Availability,* July 1994.

Parametrix, Inc., *Environmental Analysis of Future Water Source Options,* December 1994.

Columbia River Option
Regional Water Supply Plan - Portland Metropolitan Area



What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. One of the source options under consideration is development of water supply from the Columbia River. An overview of key issues associated with the Columbia option is provided below.

Existing Water Supply Uses

Currently, the Columbia River is not used as a drinking water source in the Portland metropolitan region. However, the river supplies water to upstream Washington cities such as Kennewick, Pasco, and Richland, along with downstream St. Helens, Oregon.

The Port of Portland has a municipal water right to use up to 15 cubic feet per second from the Columbia River. The water will be used primarily for irrigation and non-potable industrial purposes.

Water Availability and Water Rights

Average monthly flows in the Columbia River (measured at The Dalles) range from a minimum of about 75,000 cubic feet per second (cfs) to about 400,000 cfs. (Peak daily flows can be higher or lower than these monthly averages.)

The Columbia River is heavily controlled by upstream storage and hydropower dam operations. Minimum discharge required from Bonneville Dam is currently 70,000 cfs.

The Rockwood Public Utilities District has applied for a 50 mgd water right on the Columbia River. The application is under review by the Oregon Water Resources Department.

Water availability may be limited by regulations designed to assist in recovery of threatened and endangered fish in the Lower Columbia Basin.

Potential Uses & Facilities

The region's water providers are considering development of an intake facility and treatment plant on the Columbia River. System capacities under study range from 25 to 600 million gallons per day (mgd).

The representative site for an intake and treatment facilities is located just downstream of the confluence of the Columbia and Sandy Rivers. The site is currently used for gravel processing.

The need for regional storage is also anticipated in conjunction with development of a Columbia River supply system. The representative site for a new regional storage reservoir is located on Powell Butte. A 50 million gallon underground reservoir is presently located on Powell Butte. It is used to store water from the Bull Run watershed and Columbia South Shore wells. A regional transmission line would be needed to connect the Columbia water treatment plants to the regional storage facility. Additional storage on Powell Butte could be accommodated with or without blending Columbia water with Bull Run water.

Water Quality and Treatment

The Columbia River Basin encompasses about 255,000 square miles in the United States and Canada. Both the size of the basin and diversity of land uses pose a high risk of pollution from municipal and industrial discharges, nonpoint sources, and possible accidental spills of toxic or hazardous chemicals, relative to other sources under consideration. However, large amounts of flow in the river provide significant dilution capacity for inputs to the Columbia upstream of the Portland metropolitan region.

The quality of the Columbia River water source is generally fair compared with other regional source options, and good compared with other sources nationwide. The Rockwood Water District sponsored a pilot water treatment study completed May 1994. Study conclusions state that the Columbia River is "a source of excellent quality water, better than the majority of river sources available in the USA." The report concludes that "the direct filtration process.....can effectively treat the Columbia River water." This concurs with the Regional Water Supply Plan water quality and treatment interim reports.

There are some water quality constituents which exceed drinking water standards including turbidity, micro-organisms, perhaps aluminum and a few trace organics. The water is also moderately hard.

Measurements taken between 1984 and 1992 (at the Portland airport) indicate that radionuclide concentrations are less than those set in federal and state drinking water standards. Although radionuclides have not been detected in significant concentrations, there is public concern about potential contamination from the Hanford facility upstream of the Bonneville Dam.

For purposes of the regional water supply plan, it has been recommended that treatment of the Columbia source include ozonation for disinfection, granular activated carbon (GAC) for filtration, and sedimentation basins. These processes would provide multiple barriers against microbial and organic constituents in the water, and could potentially treat particulate radionuclides. This method of treatment is assumed for purposes of the Regional Water Supply Plan project. (More advanced treatment might be needed to treat certain ionic radionuclides.)

Key Environmental Issues

Fish - Development of future water supplies on the Columbia River could affect fish populations including listed threatened and endangered salmon stocks. Impacts from flow reductions should be minimal since the contemplated diversion levels would reduce flows by a fraction of a percent even during low flow months. There could be impacts on migration of Sandy River smelt and sturgeon. A special screening design might be needed to avoid impacts on larval fish due to existing, slow water velocities in the Lower Columbia River.

Terrestrial Threatened and Endangered Species - Two threatened, endangered, or sensitive plant and bird species have been reported on or near the representative site for an intake and water treatment facility. These species could be affected by construction of potential water supply facilities. The presence of Columbia cress has not been confirmed on the site, but plants could be avoided or transplanted if it is found there. Purple martins could be affected by construction of the water intake. The installation of new pilings with nest boxes on the riverfront (avoiding the breeding season) away from the site would reduce the impact on the birds.

Wetlands - Loss of riverine wetlands at the representative site could be mitigated by restoring disturbed areas on site and/or offsetting loss of scrub/shrub emergent wetland by creating wetlands off-site.

Geotechnical Hazards - The soils on and in the vicinity of the representative site could be subject to liquefaction during seismic events. Detailed seismic studies would be needed to ascertain the geotechnical risks and determine appropriate engineering standards.

Hazardous Materials - The representative intake and facility site could be subject to contamination from off-site sources of hazardous materials. The Reynolds Metal Co. site to the southeast is currently proposed for national priority listing under Comprehensive Environmental Response, Compensation, and Liability Act (also known as "Superfund"). Additional siting analysis will take place if the Columbia is selected as a future water source for the region.

Land Use - The representative water facility site contains high voltage Bonneville Power Administration (BPA) transmission lines. It may be necessary to find an alternative site for the Columbia River intake and/or treatment plant because current BPA regulations do not allow land grade alterations and facilities to encroach under powerline easements. There are number of alternative sites which may be available and appropriate for locations of water supply facilities.

Costs

Costs of the project include both capital costs for design and construction, as well as ongoing varible costs to operate and maintain the facilities.

The capital costs to construct a Columbia River water system are estimated to be about $150 million for a 50 mgd facility, and about $82 million for a 100 mgd facility Capital facilities included in these costs involve a river intake, raw water pump station, treatment plant, finished water pump station, a regional tranmission line, and additional regional storage. Power and chemical costs are projected to be about $205 and $41 per million gallons, respectively. (Note: Variable costs may be subject to revision.)

Putting the Pieces Together

The Columbia River option will be evaluated, along with water conservation programs and other supply sources. The evaluation will involved comparing how well different resource combinations meet objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how the Columbia River fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

From the Regional Water Supply Plan interim reports List:

Murray Smith and Associates, *Evaluation of Water Rights and Water Use Permitting Requirements,* March 10, 1994.

Montgomery Watson, *Water Quality Analysis,* February 1994.

Montgomery Watson, *Water Treatment Analysis, May 1994.*

Montgomery Watson, *Surface Water Availability,* July 1994.

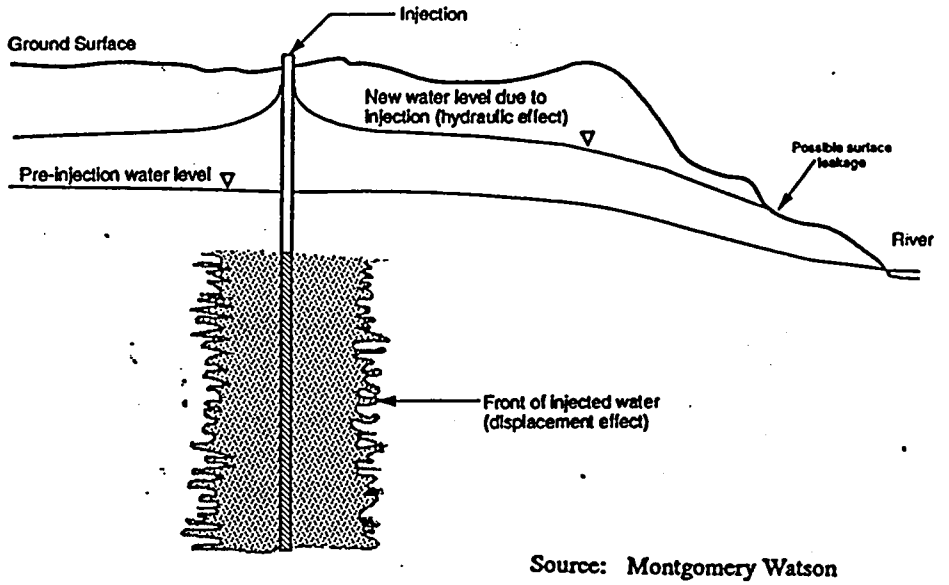
Parametrix, Inc., *Environmental Analysis of Future Water Source Options,* December 1994.

Other Sources:

Black & Veatch in Association with Lee Engineering, *Columbia River Water Treatment Pilot Study,* May 20, 1994.

Aquifer Storage & Recovery (ASR)

Regional Water Supply Plan - Portland Metropolitan Area



Source: Montgomery Watson

What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, and METRO, are developing a long-range water supply plan. The plan, to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. One of the supply management options being considered is called aquifer storage and recovery, or ASR. An overview of ASR opportunities for the region is summarized below.

What is ASR?

Aquifer storage and recovery (ASR) is a water management approach which involves storing surface water in underground aquifers (water-bearing rock strata) and then extracting the stored water for later use. This approach being considered as part of the Regional Water Supply Plan project for the Portland metropolitan area.

Aquifer storage has certain advantages over surface water reservoirs including lower evaporation losses, potentially large storage volumes, and potentially fewer and less damaging environmental impacts. In the Portland region, ASR could be used to help meet peak season demands, provide emergency backup system benefits, and improve water quality by lowering temperatures in supply distribution systems during the summer.

Existing Water Supply Uses

ASR is used in other parts of the United States such as California, Arizona, and Florida. The City of Seattle has installed and operates a 10 mgd ASR facility. In addition to providing water supply, ASR can help recharge depleted groundwater resources and prevent salt water intrusion in coastal areas.

In Oregon, ASR is being implemented in the Hermiston and St. Helens areas. A pilot project is underway to determine whether ASR is feasible to develop as part of the City of Salem's water supply system.

Currently, there are no ASR projects in the Portland region. The Joint Water Commission and Tualatin Valley Water District have sponsored studies and development of an ASR project concept. The project, which would be located in Washington County, is also part of the regional water supply planning effort. The Mt. Scott Water District in Clackamas County is also conducting a study to see how ASR might be able to help meet a portion of their supply requirements.

Water Availability and Water Rights

For purposes of the Regional Water Supply Plan project, an ASR facility would provide at least 20 million gallons of water per day (mgd) for 120 days, (generally during the summer and early fall) in order to be considered regionally significant. Limiting the evaluation to facilities of at least 20 mgd does not preclude the potential for smaller ASR projects to contribute to the region's overall supply picture over time.

It is also assumed that surface water sources for ASR could come from any of the region's current or potential supply sources. These include waters from the Bull Run, Clackamas, Willamette, Columbia, or Trask/Tualatin rivers. Generally, surface waters would be diverted and stored underground during the high flow months (e.g., winter, spring) when municipal demands are relatively low and excess water (under existing or future water rights) and treatment plant capacity would be available. Each of the sources, with the exception of the Columbia, could be accessed for ASR without requiring additional source water rights. (Additional permits would be required to inject and extract the water, however. See Key Environmental Issues below.)

Potential Uses and Facilities

Two representative sites are being evaluated as part of the regional planning project. One representative site is located in the Powell Valley area southeast of Gresham. The area under consideration is about 31 square miles. The Troutdale Gravel Aquifer was recommended for storage and recovery due to its relative thickness, unconfined geologic features, and unused capacity in the unsaturated zone above the water table.

The second representative site under study is located in the Cooper-Bull Mountain area about four miles to the southwest of the City of Beaverton in Washington County. This site is about 24 square miles in size. Water would be stored in, and extracted from, the Columbia River Basalt formation. This area is close to population and economic centers in the western portion of the region and has available storage volume due to historical groundwater depletion in the vicinity.

It is estimated that both the Powell Valley and Cooper-Bull Mountain ASR projects would involve 28 wells each. Well yields would average about 500 gallons per minute (gpm). These estimates presume that the same wells could be used for both injection and extraction. Wells

would need to be spaced about 4,000 feet apart to achieve the desired yield and prevent interference. Well yields may be overestimated for the Cooper-Bull Mountain area if interconnecting multiple water bearing zones in the aquifer is prohibited by state law.

Water Quality and Water Treatment

No known cases of significant water quality contamination exist in either the Powell Valley or Cooper-Bull Mountain representative site areas. Both sites are located outside of the Metro urban growth boundary (UGB) which should reduce the risk of contamination from urban and industrial land uses. Nevertheless, developing a comprehensive wellhead protection program will become a high priority if aquifer storage and recovery facilities are developed.

There is little information on groundwater quality at either of the representative sites and more data is needed before proceeding with an ASR project. Land uses consist mostly of single family residences with relatively large lot sizes, and some agricultural and nursery uses. Groundwater in the Powell Valley area may be naturally protected in part by a relatively impermeable layer of sediment at the ground surface.

Available data shows that groundwater quality is variable in the Cooper-Bull Mountain area. Several samples contained high levels of total dissolved solids which is not uncommon in groundwater sources. In addition, saline water may have migrated upward through the faults and fractures of the basalt rocks. Generally, the water quality in the upland basalt aquifers is fairly good. It may be possible to obtain groundwater samples from existing private wells to enhance the level of information on groundwater quality in the vicinity of ASR representative sites.

Under current state law, source waters for ASR would need to meet safe drinking water standards prior to injection into the ground. It is assumed that water sources for ASR in the Portland metro region would have already been treated (i.e., filtered and/or disinfected) to meet drinking water standards. The water might need to be disinfected after extraction before it can be distributed for potable uses. For water quality issues associated with potential ASR source water, please refer to fact sheets on the Bull Run Dam No. 3, Columbia River, Willamette River, Clackamas River, and Trask/Tualatin rivers options.

One of the assumptions associated with the ASR concept is that there will not be extensive mixing between the source water and ambient groundwater in the aquifer. As mentioned above, the source water may come from one or more of the existing or future regional water supply sources. The raw water quality of new or expanded sources ranges from fair to excellent. Each can be treated to meet state and federal drinking water standards. Please refer to source-specific fact sheets for additional detail.

The extent and effects of interaction between the source water and the groundwater is important to consider when conceptualizing a potential ASR project. Changes in temperature, chemical quality, and physical characteristics can cause mineral precipitation, biological reactions, or blockages which can affect the aquifer and clog wells. While the planning project has involved some preliminary analysis, a pilot project would be needed to determine whether and to what extent problems occur, and how they can be mitigated through project siting, operation, and/or design.

Protecting the water quality of water stored in aquifers is also an important issue. Prevention of contamination can be acheived throught the establishment of standards for land use and land

management practices in the vicinity of the wells.

Key Environmental Issues

Fish and Aquatic Life - Instream flow impacts would occur during the winter high-flow months when ASR source water is diverted for injection. Implementation of ASR could reduce the need to divert surface water flows during the summer and early fall when streamflows are typically low and critical for fish and aquatic organisms. This would likely benefit aquatic species. Potential reduction in winter flows to supply an ASR project would be very small relative to current flows in the Clackamas, Willamette and Columbia Rivers.

Well Interference - Technical and water quality considerations include potential interference between an ASR facility and both existing groundwater wells and surface water bodies (including wetlands) during injection and/or extraction of the source water. Interference can occur when groundwater levels and pressures change due to pumping or extraction. In addition, increasing water levels could interact with existing land uses (e.g., rock and aggregate mines) causing water quality problems. Hydrogeologic investigations and pilot tests would be needed to determine the extent of potential interference with land uses and the beneficial uses of groundwater and surface water.

"Commingling" of Water - Drilling wells through different water bearing zones could pose risk of contamination between the zones. This "commingling" of groundwater is prohibited by state law. There are also risks of point and non-point source contamination from surface land uses. Stringent well construction approaches and effective wellhead protection programs would be warranted to help manage such risks.

Costs

Costs of the project include both capital costs for design and construction, as well as ongoing varible costs to operate and maintain the facilities.

The capital cost to construct an ASR facility that can produce 20 mgd at the Powell Valley Representative Site is projected to be about $15 million. The power and chemical costs are estimated to be about $208 per million gallons.

The capital cost to construct an ASR facility that produce 20 mgd at the Cooper-Bull Mountain Representative Site is projected to be about $17 million. The power and chemical costs are estimated to be about $177 per million gallons.

The cost for post-extraction disinfection will vary depending on the source water used for injection.

Costs shown hhere for power and chemicals pertain to a four-month extraction period post-extraction disinfection only.)

Putting the Pieces Together

Aquifer storage and recovery will be evaluated, along with water conservation programs and other supply sources. The evaluation will involved comparing how well different resource combinations meet objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how aquifer storage and recovery fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

Squier Associates, Inc. and Montgomery Watson, *Screening of Potential Aquifer Storage and Recovery Areas, January 31, 1994.*

Mongomery Watson, *Aquifer Storage & Recovery Detailed Analysis Report, May 1994.*

Parametrix, Inc., Environmental Analysis of Future Water Source Options, December 1994.

TRASK/TUALATIN (Barney Reservoir) Source Option
Regional Water Supply Plan - Portland Metropolitan Area

What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. These options involve baseline assumptions about facilities already existing in or committed to the region. One source option is the expansion of existing supply systems using the Trask (Barney Reservoir) and Tualatin Rivers. An overview of key issues associated with this option is provided below.

Existing Water Supply Uses

The Trask/Tualatin System currently provides municipal water supply to over 120,000 residents and to many business and institutional customers within the western portion of the regional water supply plan study area. The current capacity of the water system within the planning area is about 43.5 million gallons per day (mgd). Water is diverted and treated to meet drinking water standards in two locations. The first, owned by the City of Hillsboro, is a small slow sand filter plant (3.5 mgd) near the community of Cherry Grove. The second is a full treatment plant owned by the Joint Water Commission (JWC), consisting of Hillsboro, Forest Grove, Beaverton, and the Tualatin Valley Water District. It is located just south of Forest Grove and currently has a capacity of 40 mgd.

Together, these plants serve a large rural area of Western Washington County, the incorporated communities of Cove Orchard (Yamhill County), Cherry Grove, and Dilley, the Cities of Gaston, Cornelius, and the Laurelwood Academy Water Cooperative. In addition, they serve the full needs of Hillsboro and Beaverton and some of the needs of Forest Grove and the Tualatin Valley Water District.

Water Availability and Water Rights

The JWC and its members hold about 102 cubic feet per second (cfs) or 66 million gallons per day (mgd) of water rights to divert water from the Tualatin River. (Beaverton holds additional rights to a portion of water produced by the JWC plant.) Of that, 43.5 mgd are actually diverted at this time. However, this water is not available during the dry season, which typically lasts from early June through September. During this time, Hillsboro and JWC must rely on water released from storage. Currently, there are two reservoirs for use: Hagg Lake on Scoggins Creek, which is a tributary of the Tualatin, and the Barney Reservoir on the Trask River. Together, they have a total of 21,500 acre

feet of storage (47.5 mgd for the normal dry season).

In addition, an expansion of the Barney Dam on the Trask River is under construction. Upon completion, it will add 14,000 acre feet (38 mgd for the normal dry season), for use by JWC. While this totals 96.3 mgd, there is loss from transpiration and evaporation, and required releases for fish. Also, the dry season lasts longer during some years. Reliable reservoir storage capacity on this system is about 80 mgd. The JWC and its members hold water rights to 18,000 acre feet of storage of the Barney Reservoir (including expansion) and 13,500 acre feet of storage of the Scoggins Reservoir as well.

Potential Additional Capacity

An expansion of the JWC treatment plant is ready to go to bid, with construction planned to be completed by mid-1997. A total of 63.5 mgd from the original plants and this expansion are included in the baseline capacity assumptions for the RWSP.

Transmission facilities from the plant to Hillsboro and further east are limited to under 40 mgd. With the expansion of the dam and treatment plant, JWC is also in the process of constructing a new transmission line that will allow use of the full expanded capacity of the reservoir. This line is targeted for completion in 1997 or 1998, and is also part of the RWSP baseline capacity assumptions of 63.5 mgd for the Trask-Tualatin System.

Water Quality and Treatment

The relative quality of the Tualatin River raw water is generally good when compared with other regional source options, and very good compared with sources nationwide. The river has a lower incidence of natural and human-caused contaminants than some of the other proposed sources. There are some constituents that exceed drinking water standards including turbidity and microorganisms. Sporadic increases in turbidity and nutrients (e.g., nitrogen, phosphorus) can occur during high flow periods. Existing facilities treat the water readily to meet drinking water standards.

The upper Trask and Tualatin watersheds are largely in forest use while the lower watershed contains diverse land uses and is experiencing rapid population growth. However, the Hillsboro Cherry Grove intake is upstream from any known residences, and the JWC intake is upstream from any sewage treatment plant discharges. Therefore, population growth should have little impact on water quality for this source.

Currently, JWC and Hillsboro filter and chlorinate water from the Trask/Tualatin System. This process has been effective in producing high-quality potable water that surpasses all safe drinking water standards.

For purposes of the Regional Water Supply Plan, it has been recommended to the project participants that future treatment replicate existing conventional treatment of sedimentation and filtration with the use of granular activated carbon for filtration. The use of granular activated carbon would provide a barrier against microbial and organic constituents in the water. The expansion of the JWC treatment plant will include capacity for this level of treatment.

Key Environmental Issues

Expansion of the Barney Reservoir on the Trask River involved completion of a full environmental impact statement (EIS) and review and approval by a large number of governmental agencies. All necessary

permits including U. S. Army Corps of Engineers 404 permit and State of Oregon Division of State Lands permit have been issued to allow construction to begin. Mitigation for lost wetlands, transplantation of a rare plant, restoration of elk habitat, and replacement of spawning beds for the native cutthroat trout were the major environmental concerns, and mitigation plans have all been approved.

All land use and construction permits from Washington County have also been issued.

Costs

The capital costs of the committed expansions of the system capacity on the Trask-Tualatin are estimated to be about $50 to $60 million for the 20 mgd increment. These costs are not included in the RWSP as these expansions are considered to be baseline assumptions. Power and chemical costs are projected to be about $81.18 and $19.54 per million gallons, respectively.

Putting the Pieces Together

The Trask/Tualatin (Barney Reservoir) source option is considered as a baseline assumption and therefore a part of each source option being considered for the RWSP. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how the Trask-Tualatin system fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

From the list of reports produced for the Regional Water Supply Plan project:

Murray Smith and Associates, *Evaluation of Water Rights and Water Use Permitting Requirements,* March 10, 1994.

Montgomery Watson, *Water Quality Analysis,* February 1994.

Montgomery Watson, *Water Treatment Analysis,* May 1994.

Montgomery Watson, *Surface Water Availability,* July 1994.

Parametrix, Inc., *Environmental Analysis of Future Water Source Options,* December 1994.

Additional source:

U. S. Army Corps of Engineers Final Environmental Impact Statement, Barney Reservoir Expansion, May, 1994.

Conservation Opportunities
Regional Water Supply Plan - Portland Metropolitan Area

Residents of the Portland metropolitan area hold a high value for water conservation, according to a recent survey sponsored by the metro region's water providers. The Portland area has been blessed with access to several high quality water sources. But as the region is expected to grow by 800,000 people by the year 2050, there is a need to ensure that high quality water for the future. To meet the increase in water demand that

will certainly accompany such growth, 27 of the areas water providers and Metro have come together to devise the Regional Water Supply Plan. The first phase of the plan projected future regional water demand, evaluated potential sources, and identified ways to conserve water. The second phase is now underway, and participants are trying to identify the conservation measures most suitable for this region.

Conservation as a Resource Option

Through the regional planning process, the water providers are evaluating the best ways to combine conservation with potential water source options. This method treats conservation as a resource option to meet future demand and highlights successful means of using our current water sources more efficiently. Conservation savings aim to delay and/or reduce the need for new sources.

Selecting Conservation Measures

The project team has created this process to identify which conservation measures best meet the region's needs:

Update the water demand forecast. Regional population growth estimates and "naturally occurring conservation" both serve as the base for projected water demand. Naturally occurring conservation refers to future reduction in demand that is expected to occur without any additional water provider effort. In this case, it results overtime, by replacing old plumbing fixtures with the new efficient fixtures now required by national legislation.

Identify the universe of conservation measures. A list was compiled of over 100 water saving technologies and management practices that are available to the region. The list included measures applicable to indoor and outdoor uses in the residential, commercial, and industrial, and institutional sectors.

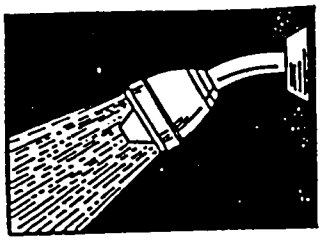
Apply a qualitative screen to narrow the broad list. The qualitative screen assesed the viability of each conservation measure using the following criteria: the level of technological development, customer acceptance, environmental and health concerns, and the availability of other measures that reduce demand more effectively.

Develop technology profiles. The profiles detail the cost, savings, and lifetime of each measure passing the qualitative screen.

Apply an economic screen. Economic criteria were used to eliminate any measures that were clearly not cost-effective for the region. The costs of water savings from individual conservation measures were compared to the preliminary costs of viable future water supply options. A benefit-cost advantage was assigned to conservation measures to account for factors that were difficult to quantify (e.g. the avoided cost of transmission operation and maintenance, and environmental impacts.) The majority of conservation measures passed this economic screen. Any measure passing this screen remains under consideration so none are prematurely excluded based on cost alone.

Package the remaining measures into conservation programs. Program concepts include components such as water savings, participation targets, delivery mechanisms, and cost (see attachment 1). General approaches include education and awareness, technical assistance, financial incentives, direct installation, and regulation.

Integrate program details into the resource planning model to evaluate along with potential supply options. Three different conservation program levels were designed for use in the integration model. Each is increasingly aggressive in nature and they are outlined as follows:



LEVEL 1

At this level of effort, the water providers would take an educational, informational approach toward implementing conservation. The measures included in Level 1 rely on customer initiative to achieve water savings. Level 1 would also provide the foundation of customer awareness necessary for the next levels to succeed. Examples include:

In the residential sector:

- water education and awareness
- landscaping workshops for customers
- workshops for people working in landscaping-related trades

In the commercial, institutional & industrial sector:

- preparation and distribution of materials on efficient plumbing appliances and outdoor water uses
- heating, ventilation and air-conditioning equipment workshops

- irrigation workshops and workshops for people working in the landscaping-related trades

LEVEL 2

Level 2 focuses on using cost-effective, market-based incentives to encourage water conservation. The water providers would offer customers on-site water audits, technical assistance, and financial incentives. Examples include:

In the residential sector:
- water audits
- appliance labeling and incentives
- landscaping and irrigation system rebate program

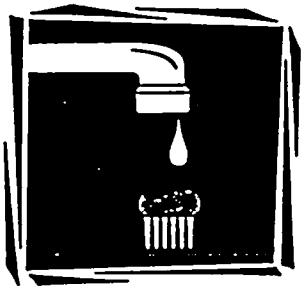
In the commercial, institutional & industrial sector:
- indoor, outdoor and large landscape water audits
- heating, ventilation, and air conditioning financial incentives
- industrial process optimization
- technical assistance
- landscaping and irrigation system rebates

LEVEL 3

The third level is the most aggressive level of conservation under consideration in the planning effort. Under Level 3, water providers would pay to install conservation measures directly, at little cost to the customers. Level 3 also involves the possible adoption of landscaping ordinances. Examples include:

In the residential sector:
- Ultra-low flush toilet rebate
- landscape ordinance

In the commercial, institutional & industrial sector:
- Ultra-low flush toilet regulation and retrofit rebates
- single-pass cooling program
- landscape ordinance



Putting the Pieces Together

Conservation programs will be evaluated for the magnitude of water savings they provide, how long these savings will continue, the costs and avoided costs and impacts, the level of public acceptability, organizational feasibility, and whether they occur in the summer, winter, or year-round. Through the plan integration process, the region's water providers are looking for the optimal mix of conservation and new supply sources that meet citizens' needs and values.

Cost

Costs for implementing conservation programs will vary according to the level of the program. For each level, there are costs to the water utility - either administrative costs, capital costs or both - and costs to the customers. All costs presented below span the length of the planning period, to the year 2050.

Implementation of a Level 1 conservation program would have a present value cost to the water utility of $215 million, all of which would be administrative costs. The cost to customers would be $10 million over the length of the planning period.

Level 2 conservation would have a total present value cost to the utility of $360 million, $285 million of which would be administrative costs and $75 million capital costs. The cost to customers would be $50 million over the length of the planning period.

Costs for implementing Level 3 conservation would have a total present value of $375 million to the water utility, $300 million of which would be administrative costs and $75 million capital costs. Over the length of the planning period, the cost to customers would be $145 million.

Please see the attachment for a breakdown of the savings each conservation program would offer.

Conservation Rate Design

Another idea under consideration is conservation rate design, which may be used to complement other conservation efforts. Under this system, the unit price of water increases as water usage increases, so it will cost a customer more to use more water. Some providers in the metropolitan region have already implemented some type of conservation rate design; others have not.

In evaluating both conservation programs and conservation rate design, it is important to avoid double counting the anticipated water savings. For instance, the incremental savings from conservation rates should be added to savings from conservation programs already planned or underway. Depending on the programs in place, incremental savings from conservation pricing are expected to range between 3.5 to 5% in the region.

What You can Do

If you would like further information on how conservation fits in to the regional water supply plan project, please contact your local water provider or the Regional Water Supply Plan project management staff at 823-7528.

Information Sources

Barakat & Chamberlin, *Conservation Program Descriptions - Final Report,* May 17, 1995.

RWSP *Demand Management and Conservation Element,* July 7, 1994.

SUMMARY OF CONSERVATION SAVINGS

RESIDENTIAL PROGRAMS

Level 1 - Education & Workshops	MGD Saved Year 2025	MGD Saved Year 2050	Target Market
Residential Education	3.26	4.32	All residential customers
Residential Customer Landscaping Workshops	0.81	1.52	Existing home relandscapes
Trade Ally Landscaping Workshops - Res. Portion	0.82	1.74	New landscaping & irrig. equip.
Subtotal Level 1	**4.89**	**7.58**	
Level 2 - Technical Assistance & Incentives			
Residential Audits	0.91	0.91	Existing customers - top 20%
Appliance Tagging and Incentives	2.16	3.07	New & replacement clotheswashers
Residential Outdoor Incentives	5.00	12.90	New & replacement landscaping & irrig. equip.
Subtotal Level 2	**8.07**	**16.88**	
Level 3 - Retrofit & Regulation			
Residential ULFT Rebate	2.05	-	Retrofit of existing inefficient toilets
Residential Landscaping Ordinance	8.51	22.05	New landscaping and irrigation systems

CI&I PROGRAMS

Level 1 - Education & Workshops	MGD Saved Year 2025	MGD Saved Year 2050	Target Market
Commercial Plumbing & Appliances Educ.	0.35	0.45	All CI&I customers
HVAC Workshops	0.45	0.45	Existing CI&I
CI&I Outdoor Education	0.34	0.44	All CI&I customers
CI&I Watering Practices Workshop	0.14	0.14	All CI&I customers & trade allies
Trade Ally Landscaping Workshops - CI&I Portion	0.47	1.22	New landscaping and irrigation equipment
Subtotal Level 1	**1.75**	**2.70**	
Level 2 - Technical Assistance & Incentives			
CI&I Indoor Audits	0.44	0.44	Existing customers - top 20%
CI&I Outdoor Audits	0.78	0.78	Existing customers - top 20%
Large Landscape Audits	0.98	0.98	Existing large landscapes
HVAC Incentives	1.33	1.70	New and replacment HVAC equipment
Industrial Process Technical Assistance & Incentives	2.01	2.97	New, replacement, & existing indust. process
CI&I Outdoor Incentives	2.41	6.60	New landscaping and irrigation equipment
Subtotal Level 2	**7.95**	**13.47**	
Level 3 - Retrofit & Regulation			
CI&I ULFT Direct Install and Incentives	2.00	-	Retrofit of existing inefficient toilets
Single Pass Cooling	0.27	0.27	Retrofit of existing single pass systems
CI&I Landscaping Ordinance	4.42	12.35	New landscaping and irrigation systems
CI&I ULFT Regulation	3.97	8.05	

GRAND TOTALS WITHOUT CONSERVATION RATE

LEVELS 1 & 2	**22.66**	**40.63**
% of Average Regional MGD Seasonal Demand [1]	**8%**	**12%**
LEVELS 1 & 2 W/ CI&I ULFT REG AND SINGLE PASS:	**26.90**	**48.95**
% of Average Regional MGD Seasonal Demand*	**10%**	**14%**
LEVELS 1, 2, & 3 W/O ORDINANCES	**30.95**	**48.95**
% of Average Regional MGD Seasonal Demand*	**12%**	**14%**
LEVELS 1, 2, & 3 W/ ORDINANCES [2]	**36.47**	**63.85**
% of Average Regional MGD Seasonal Demand*	**14%**	**18%**

[1] Figures used are average MGD price net seasonal demand in the medium scenario for the years 2025 (268 MGD) and 2050 (350 MGD).
[2] When the ordinances are in effect, outdoor incentives are not offered.

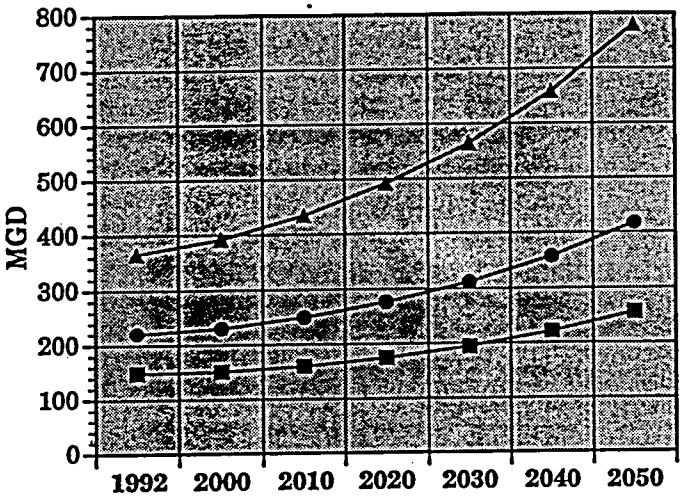
See next page for grand totals with conservation rate.

GRAND TOTALS WITH CONSERVATION RATE

Program Savings: LEVELS 1 & 2	22.66	40.63	
Additional Savings with Conservation Pricing	13.40	17.50	(5% of av. seas'l MGD in 2025 and 2050 [1])
GRAND TOTAL: Programs + Pricing	36.06	58.13	
% of Average Regional MGD Seasonal Demand [1]	13%	17%	
Program Savings: 1 & 2 W/ CI&I ULFT REG & SINGLE PASS:	26.90	48.95	
Additional Savings with Conservation Pricing	13.40	17.50	(5% of av. seas'l MGD in 2025 and 2050 [1])
GRAND TOTAL: Programs + Pricing	40.30	66.45	
% of Average Regional MGD Seasonal Demand [1]	15%	19%	
Program Savings: LEVELS 1, 2, & 3 W/O ORDINANCES	30.95	48.95	
Additional Savings with Conservation Pricing	10.72	14.00	(4% of av. seas'l MGD in 2025 and 2050 [1])
GRAND TOTAL: Programs + Pricing	41.67	62.95	
% of Average Regional MGD Seasonal Demand [1]	16%	18%	
Program Savings: LEVELS 1, 2, & 3 W/ ORDINANCES	36.47	63.85	
Additional Savings with Conservation Pricing	9.38	12.25	(3.5% of av. seas'l MGD in 2025 and 2050 [1])
GRAND TOTAL: Programs + Pricing	45.85	76.10	
% of Average Regional MGD Seasonal Demand [1]	17%	22%	

[1] Figures used are average MGD price net seasonal demand in the medium scenario for the years 2025 (268 MGD) and 2050 (350 MGD) .

Regional Water Demand Forecasts
Regional Water Supply Plan - Portland Metropolitan Area



PORTLAND REGIONAL WATER DEMAND FORECAST 1992-2050 High Range*

- Peak Day
- Peak Season
- Non-Peak Season

* Includes naturally occuring conservation

Source: Barakat & Chamberlin, 1994

What is the Regional Water Supply Plan?

As shown in the graph above, water demand in the Portland Metropolitan Region is expected to increase substantially over the next 50 years or so. To address future water needs, twenty-seven cities and water districts in the region, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region.

Role of the Water Demand Forecast

The water demand forecasts play an integral role in the Regional Water Supply Plan (RWSP) project for the Portland metropolitan region. The forecasts, in conjunction with information on existing water supplies and infrastructure (treatment, transmission) provide the basis for determining how much additional water and/or water savings the region will need in the future.

General Demand Forecasting Methodology

Project consultants generated the water demand forecasts for the Regional Water Supply using an econometric/end-use model. This model translates the effects of projected population and economic growth, weather variability, anticipated conservation and other factors into estimated future water needs through the year 2050. The model applies separate demand forecasting equations for the cities and districts participating in the

project. These equations have been customized and to capture the demand patterns of 47 different entities from throughout the tri-county region.

The model relies on population growth projections provided by the Portland area Metropolitan Service District (Metro). Metro has projected future growth in households and employment as part of the Region 2040 project. Metro created high, medium, and low projections to reflect uncertainties inherent in the forecasts. The water demand forecasting model translates Metro's forecasts into high, medium and low projections for future. Those projections, are key variables in the demand forecasting system.

Several key variables in the model depict the relationship between water demand and weather. These relationships were established by analyzing how water demand changes with the variation in historical precipitation and temperature patterns, as well as during extremely hot dry periods. The model also applies peaking factors for participating water providers and several non-participants to generate forecasts for individual entities.

In this instance, the naturally occurring conservation relates to existing legislation which allows only low-flow plumbing fixtures to be installed in new construction. The term "vintaging" refers to the rate at which existing and future building stock would be expected to incorporate low-flow fixtures. The application of this model serves to reduce the demand forecasts over the 50-year planning horizon.

Finally, the model factors the effect of anticipated real price increases over time into the forecasts. (A "real price increase" is that increase over and above the rate of inflation.) The conceptual basis for this piece of the modelling is an expectation that the real cost of providing water will grow by some amount due to factors such as increasing cost of complying with regulatory standards and replacing obsolete facilities. For the high forecast, no change in price was assumed. For the medium and low forecasts, 0.25 and 0.5 percent annual price increases were assumed.

The forecasts indicate that winter-time (non-peak season) demands could increase from 21 to 72 percent region-wide, with a mid-range estimate of 52 percent. Peak-season demand increases are projected to range from 26 to 87 percent, with a mid-range of 58 percent.

Forecast Results

Regional Demand Forecasts (in mgd)

	Non-peak Season		Peak Season		Peak Day	
	1995	2050	1995	2050	1995	2050
High Estimate	149	257	223	417	366	780
Med. Estimate	148	225	221	350	365	667
Low Estimate	147	178	219	275	365	535

In addition, an end-use, vintaging model predicts the effects of "naturally occurring conservation." "Naturally occurring conservation refers to the amount of future reduction in demand which is expected to occur without any additional water-provider effort.

Peak-day regional demands are expected to increase by 28 to 93 percent, with a mid-range of 62 percent. These demand forecasts reflect population growth forecasts received from Metro of about 735,000 new residents in the tri-county urban areas, about a 70 percent

population increase from 1992 to 2040. (The demographic forecasts were extended to 2050 for purposes of the Regional Water Supply Plan

Demand increases are projected to vary by county with the greatest proportional changes predicted for Washington and Clackamas counties. For example, high-peak day demand is projected to increase by 136 mgd or 137 percent in Washington County, 107 mgd or 121 percent in Clackamas County, and 100 mgd or 54 percent in Multnomah County. These differences reflect differing anticipated growth patterns in each county.

Putting the Pieces Together

The Region's providers are in the process of evaluating how well different resource combinations meet not only future water demand but objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

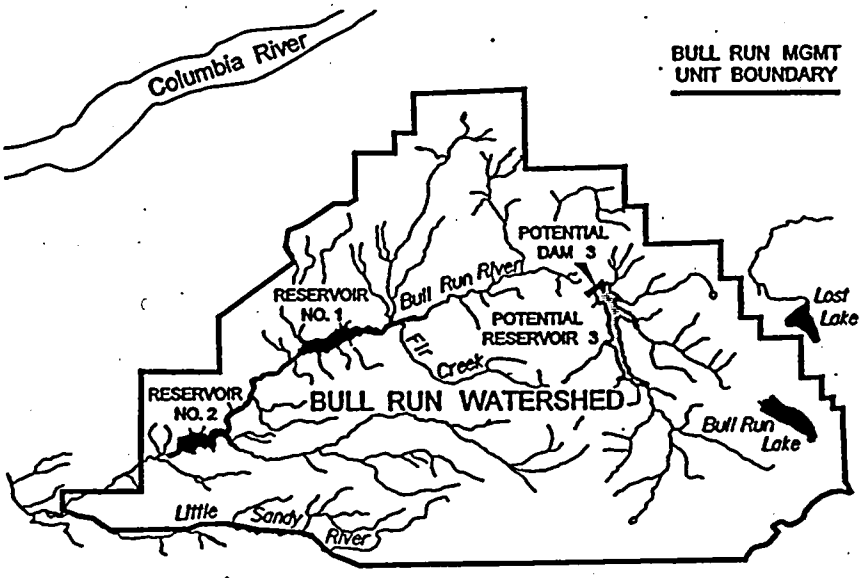
Information Sources

Barakat & Chamberlin, Inc., regional water demand forecast information prepared for the Regional Water Supply Plan project.

METRO, data and information prepared for the Region 2040 project.

Bull Run Dam No. 3 Option

Regional Water Supply Plan - Portland Metropolitan Area



What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. One of the supply options under consideration is a third dam and reservoir in the Bull Run Satershed. An overview of the Bull Run Dam No. 3 option is provided below.

Existing Water Supply Uses

The Bull Run River has been the primary source of drinking water for the City of Portland for 100 years. Cities and water districts in the region have purchased Bull Run water wholesale for decades. The Bull Run Watershed, located about 35 miles east of Portland in the upper Sandy River Basin, includes approximately 179 square miles. Most of the watershed lies within the Bull Run Watershed Management Unit (BRWMU), an area of 150 square miles. The BRWMU is closed to the general public to maintain high water quality.

Currently, the Bull Run Watershed provides water to about 750,000 people, about one-quarter of the Oregon population. The Bull Run River was the original water supply source for Portland. Bull Run Lake, located at the headwaters of the watershed, was the first source of water used to supplement river flows during the summer season. Today Bull Run Lake is used only in very dry years. The City of Portland constructed one reservoir in the watershed during the 1920's and another in the 1960's. These reservoirs provide more than 50,000 acre-feet of storage capacity.

The reservoirs remain full during much of the year. In the warm summer months, these reservoirs are drawn down to meet the higher demand for water. The system relies on fall, winter, and spring rains (rather than winter snowpack) to ensure that the reservoirs start out full at the beginning of the summer drawdown season.

Unlike most other water suppliers in the United States, the City is not required to filter Bull Run water because the raw water quality is so high. Reservoirs collect sediment from natural processes over time. Because the water is not filtered, the City must take special precautions to prevent degradation of water quality caused by the stirring up of sediment in and adjacent to the reservoir pools.

One strategy is to avoid drawing the reservoirs down below specified elevations. Restricting drawdown reduces the risk of erosion off the banks Restricting drawdown also limits total usable water stored in the reservoirs to about 10.2 billion gallons (or about 31,000 acre-feet). As summer ends and the fall rains begin, the reservoirs usually refill quickly and the cycle is repeated.

Bull Run water is disinfected at the system Headworks (where intakes are located). The water is then fed by gravity from the Bull Run Watershed to the Portland metropolitan region via several large conduits. The water is brought to a 50 million gallon underground reservoir at Powell Butte (southwest of Gresham). The current transmission capacity from Bull Run into the metro region is 210 million gallons per day (mgd). In ninety-five percent of the years, the existing Bull Run system can meet a demand of about 146 mgd during the summer and early fall (June-October).

Water Availability and Water Rights

Currently, the City of Portland and 19 wholesale customers use about 25 percent of the total water yield of the Bull Run Watershed, or about 37 billion gallons per year. In 1909, the Oregon Legislature granted Portland the exclusive right to use the waters of the Bull Run River for municipal purposes. The City of Portland has and could continue to expand the municipal use of Bull Run water without obtaining additional water rights.

The City of Portland has registered a claim with the state to use up to the full flow of the Bull Run River. The registration sets forth a priority date for use of August 6, 1886. The verification of this claim is subject to adjudication of the Sandy River Basin.

The City has water rights to divert up to 3,500 cubic feet per second (cfs) of Bull Run Water to generate hydroelectric power at two power stations just below the dams.

Preserving flows to meet aquatic systems health objectives is part of the recently established Northwest Forest Plan. However, no specific instream flow requirements have been set for the Bull Run River. The Bull Run River is located upstream of a portion of the Sandy River which is a designated State Scenic Waterway and Federal Wild and Scenic River. The Oregon Water Resources Commission has established flow levels (or "Diack" flows) needed to meet the objectives of the State Scenic Waterway authorizing legislation.

Potential Uses and Facilities

A third dam and reservoir in the Bull Run are being evaluated as part of the Regional Water Supply Plan project. The representative site for the potential project is located below the confluence of the Log

Creek and Blazed Alder tributaries on the main stem of the Bull Run River.

At a maximum dam height of about 400 feet, this project could provide an additional 67,520 acre-feet, or about 22 billion gallons, more than double the existing reservoir storage in the watershed. It is estimated that the average daily peak season availability would increase by about 134.8 mgd (with 95 percent annual reliability). Supporting facilities would include new access road(s), intake facilities, Headworks expansion, a new conduit(s) from the watershed to the Portland metro area, and additional regional storage at Powell Butte.

Water Quality and Treatment

The quality of raw Bull Run water is excellent generally compared to the other regional water supply sources under consideration for future water supply, and is among the highest in the country. Currently, Bull Run water does not require treatment other disinfection with chlorine, followed by addition of ammonia to meet State and Federal drinking water standards. It is one of the few remaining unfiltered surface water supplies in the United States. Filtration requirements have been avoided due to the very high quality of the water produced directly from the watershed and the City's watershed protection program.

One concern is how developing a third reservoir in the Bull Run might affect the water quality of the existing supply system downstream. Water quality in the river and the two existing reservoirs could be affected during construction of Bull Run Dam No. 3. Substantial changes could result in requirements to build a filtration system estimated to cost between $150 million and $250 million. However, preliminary geotechnical analysis indicates that major water quality impacts such as high levels of sediment and turbidity from the project could be avoided or mitigated during construction.

To address the possibility that future regulations or changes in water quality would require the Bull Run supply source to be filtered, the Regional Water Supply Plan project included the cost of a Bull Run alternative that includes filtration. Findings from previous studies indicate that Bull Run water can be effectively treated (filtered and disinfected) to meet all drinking water regulations. The treatment processes found to be effective and recommended for use if filtration is required at some point include ozonation disinfection and the use of granular activated carbon (GAC) for filtration. Filtering Bull Run water would provide about 34 mgd additional supply availability for an average peak day (applying a confidence of 95%).

Key Environmental Issues

Fish - The development of a third dam and reservoir in the Bull Run watershed could have potential impacts on fish (including cutthroat and rainbow trout, coho salmon, and potentially bull trout). Resident fish populations in the upper Bull Run watershed could be further segregated or isolated from spawning or rearing habitat. The project would reduce riverine habitat and could cause changes in downstream temperatures. Increased rearing habitat and food availability in the impoundment area could increase fish growth and production capabilities and change species composition. Flow impacts in the Lower Bull Run and Sandy Rivers could change sedimentation rates and water quality, and could affect fish populations and habitat downstream. Some of these impacts could potentially be mitigated by releasing water from the reservoir system for instream flow purposes.

Wetlands - A third dam and reservoir could affect riparian wetlands adjacent to the Bull Run river or its tributaries due to disturbance from construction or reservoir filling. The project would cause permanent loss of the perennial

streamflow and associated riverine wetlands along the river and its tributaries within the potential pool area.

Wildlife and Terrestrial Threatened and Endangered Species - Bull Run Dam No. 3 also has the potential to affect terrestrial wildlife. The project would result in the loss of about 640 acres of high quality, diverse wildlife habitat. Of key concern are potential impacts on the northern spotted owl population resulting from the loss of approximately 330 acres of suitable owl habitat in the reservoir pool area. A small population of Howell's daisy, a candidate for federal listing as a threatened or endangered specie, could be flooded by the reservoir, depending on the exact location of the plants and pool level. Bald eagle, common loon, fir club-moss, and a plant called kruhsea are also found in this vicinity, but impacts to these species are unlikely. Loss of habitat would affect amphibians, reptiles and small mammals. Larger mammals and birds would be displaced and might be unable to find suitable unoccupied habitat.

There are 408 plant and animal species of concern identified for analysis and protection pursuant to the President's Northwest Forest Plan. The Forest Plan requires that an analysis Bull Run Watershed (and other designated Key Watersheds and Riparian Reserves) be conducted to assess the condition of specified resources. A compilation of existing species data, and possible inventories of those species expected to exist in the area, will be conducted as part of the required Watershed Analysis (scheduled to begin during 1996). Providing direct mitigation for impact on wildlife and habitat would be challenging. However, opportunities to acquire, protect, and/or restore alternate habitat areas have not yet been explored. More information on the President's Forest Plan is provided below.

President's Northwest Forest Plan - As part of the President's Northwest Forest Plan, the Bull Run Watershed has been made part of the Mt. Hood National Forest Late-Successional Reserve. The purpose of the late-successional reserve designation is to maintain a functional, interactive, old growth forest ecosystem. The Bull Run has also been designated a Tier 2 Key Watershed. The Tier 2 Watershed designation was applied to highlight the importance of maintaining high water quality.

No programmed timber harvest is allowed in late-successional reserves. Thinning can occur under very stringent conditions. The Standards and Guidelines prohibit or discourage land management activities that adversely affect the riparian areas. Tier 2 Key Watershed designation requires strict conformance with an Aquatic Conservation Strategy that is included in the Standards and Guidelines. The Aquatic Conservation Strategy involves maintaining instream flows to sustain riparian, aquatic, and wetland habitats; and maintaining and restoring the species composition and structural diversity of aquatic dependent species. This requirement could be imposed on a third dam and reservoir in the Bull Run Watershed.

Because the Forest Plan was only recently adopted, the process for review and action on a third dam in the Bull Run is uncertain. The Standards and Guidelines would require that siting a third dam in the Bull Run be evaluated as a special case subsequent to completion of a Bull Run Watershed Analysis and necessary amendments to the Mt. Hood Forest Plan and Bull Run Final Environmental Impact Statement (FEIS).

The Standards and Guidelines have language indicating that new development proposals which address public needs or provide public benefits may be approved if it can be shown that adverse environmental impacts can be minimized and/or mitigated. This provision could provide avenues for development of Bull Run Dam No. 3.

The Forest Service has not established protocols for environmental impact minimization and mitigation for Late-Successional Reserves and Key Watersheds. Such definitions may emerge from the Watershed Analysis phase of Forest Plan implementation. Mitigation may include rehabilitation of downstream waterways, flow augmentation, stabilization and/or removal of forest roads, or re-establishment of riparian corridors.

Costs

Costs of the project include both capital costs for design and construction, as well as ongoing varible costs to operate and maintain the facilities.

The estimated capital cost for the Bull Run Dam No. 3 option is estimated to be about $509 million. This includes the dam and reservoir, conduit from Headworks to Lusted Hill, Headworks improvements, and additional storage at Powell Butte.

Power requirements are negligible because Bull Run water flows into the region by gravity. Chemical costs are minimal (e.g., @$5/million gallons) given that filtration treatment is not currently required.

If the Bull Run were required to be filtered at some point in the future, the additional capital costs for a 275 mgd filtration plant are estimated to be about $115 million. Power and chemical costs are estimated to be about $90 per million gallons produced.

Putting the Pieces Together

The Bull Run Dam No. 3 option will be evaluated, along with water conservation programs and other supply sources. The evaluation will involved comparing how well different resource combinations meet objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how Bull Run Dam No. 3 fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

From the Regional Water Supply Plan list of interim final reports: Technical reports:

Squier Associates, Inc., *Bull Run Dam No. 3 Preliminary Site Selection Evaluation,* February 3, 1994.

Montgomery Watson, *Water Quality Analysis,* February 1994.

Montgomery Watson, *Water Treatment Analysis, May 1994.*

Montgomery Watson, *Surface Water Availability,* July 1994.

Parametrix, Inc., *Environmental Analysis of Future Water Source Options,* December 1994.

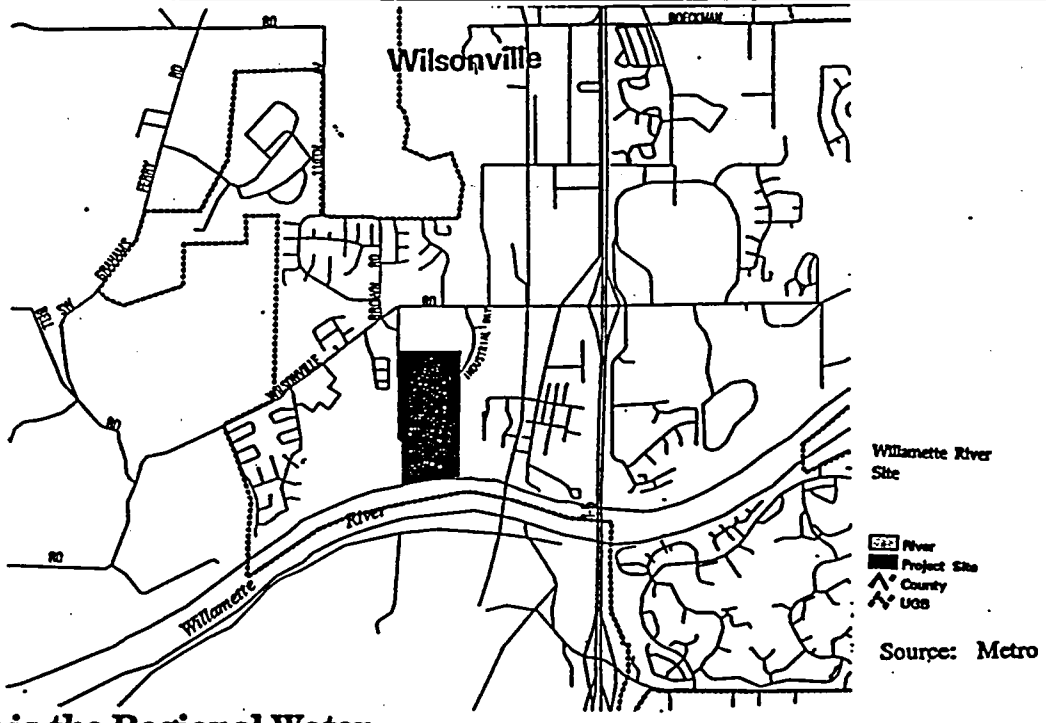
Squier Associates, *Perliminary Site Evaluation of the Log Creek Dam Site, Bull Run River,* April 19, 1995.

Other Sources:

Montgomery Watson, Water Treatment Pilot Study, April 1992.

Willamette River Option

Regional Water Supply Plan - Portland Metropolitan Area



What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region. One of the supply options under consideration is development of a municipal water supply system on the Willamette River. An overview of the Willamette River option is provided below.

Existing Water Supply Uses

The Willamette Basin is the largest river basin in Oregon. The basin is 11,000 square miles and contains 13 major sub-basins, all or parts of ten counties, about 30 cities of more than 5,000 residents each, and many major industries. Total population in the basin is about two million residents, or about 70 percent of the total Oregon population. The basin also contains some of Oregon's most productive agricultural lands, and supports important fishery resources. Water-dependent and water-related recreational opportunities abound in the basin's lakes and streams.

Currently, the Willamette River is not used as a municipal water source in the Portland metropolitan region. The river is used for municipal purposes upstream by the City of Corvallis.

The Port of Portland has a water right and is developing a non-potable water system to use up to about 22 cubic feet per second (cfs) of water from the Willamette for industrial purposes.

Water Availability and Water Rights

Median daily flows in the Willamette River at Wilsonville range from about 6,300 cubic feet per second (cfs) in August to about 48,000 cfs in January (based on mean daily flow frequencies from 1949-1972). Flows can and do run a lot lower and higher than this, however, with the extreme low flow for that period recorded at 3,600 cfs and the high flow recorded at 339,000 cfs.

Flows in the Willamette River Basin are influenced substantially by releases from 13 upstream reservoir projects owned and operated by the U.S. Army Corps of Engineers (Corps). More than half the flows are supplied through storage releases from August through October. To date, the primary use of these projects has been for flood control. Over time, the reservoirs themselves have become popular flat-water recreation facilities. The Bureau of Reclamation holds water rights to use the total usable storage of 1.6 million acre-feet for irrigation. Only about three percent of this amount has been contracted for irrigation use downstream.

The Corps, Oregon Water Resources Department and other stakeholders have proposed that a reauthorization study be conducted to determine how stored water should be allocated and how the reservoirs should be operated in the future.

Minimum perennial streamflows on the Willamette River mainstem were established in the mid-sixties to maintain flows sufficient to support aquatic life, minimize pollution, and attain the highest and best use of waters released from storage. At Wilsonville, the minimum perennial streamflow is 1500 cfs year round (for natural flow) and 4,700 cfs year round for releases from upstream storage reservoirs. The minimum perennial streamflows are set at identical levels from above Willamette Falls at Oregon City to the mouth of the river (at its confluence with the Columbia River).

The Oregon Department of Environmental Quality (DEQ) has also established a water quality flow target of 6,500 cfs from Salem to the mouth. The DEQ presumes that this amount will be available to help assimilate pollutants when reviewing applications to discharge into the river.

Participants in the Regional Water Supply Planning effort (e.g., Tualatin Valley Water District and the City of Wilsonville) hold permits to use approximately 150 mgd of Willamette River water for municipal purposes. These permits are assigned priority dates of 1973 and 1974, respectively. These permits have not been developed and are being held to supply future water demands in the region.

Participants in the regional water supply planning effort have applied for permits to use an additional 319 mgd from the river. These applications are pending action by the Water Resources Department. While technically there is sufficient natural flow available to supply these applications, there may not be enough water during low flow summer months to issue all of the pending permits without reducing flows below DEQ water quality flow targets.

There are a number of uncertainties which make availability assessments for the Willamette River hard to pin down. For example, the minimum perennial streamflows await conversion to instream water rights (pursuant to state law). The total flow amounts may change prior to conversion. In addition, Portland General Electric has registered a pre-1909 claim for substantial flows on the lower Willamette River at Willamette Falls. It is possible that when the river is adjudicated (probably some years from now) that this claim would lower the

reliability of this source for municipal purposes in the Portland region. At the same time, the Oregon Water Resources Department has been asked to reserve a large amount of natural flow and stored water to meet future municipal and irrigation demands in the basin. Finally, the ultimate fate of the Corps storage and the availability of stored water for municipal purposes remains unclear.

Despite the complexity of water allocation issues on the Willamette River, there is a good supply of water in the river and in storage. There are also many opportunities for resolving these issues in a cooperative and creative manner. Discussions among interested parties have been initiated and will continue.

Potential Uses and Facilities

The region's water providers are evaluating the possibility of a new river intake and treatment plant on the Willamette. As part of the regional water supply planning effort, capacities of the facilities under study have ranged from 25 mgd to 500 mgd.

The representative site is under consideration to co-locate an intake with fish screens, a raw water pumping plant, and treatment plant facilities. It is located on the north side of the river, just upstream of the I-5 bridge in Wilsonville. Currently, the northernmost portion of the property is used for agricultural purposes while the primary use of the site is a sand and gravel operation. The potential water supply facilities are allowable under local land use and zoning designations.

Additional regional storage would be needed in conjunction with a Willamette River Water Supply System. The representative site chosen is on Cooper Mountain. It has the advantage of being located between the river and the major population and economic centers of Washington County (on the west side of the region).

Water Quality and Treatment

The relative quality of the Willamette River raw water is generally fair relative to other regional sources and good relative to sources nationwide. The Tualatin Valley Water District sponsored a pilot treatment study of the Willamette River which concludes that "historical water quality records, as well as data collected during the pilot study indicate that the Willamette River is a high-quality source water."

There are upstream industrial and municipal discharges and nonpoint pollution sources which can impair water quality in the Willamette. Some raw water quality constituents exceed drinking water standards such as turbidity, microorganisms, and perhaps aluminum and a few trace organics. Concentrations of general and regulated inorganics are low, however certain metals have been reported at concentrations exceeding the maximum contaminant levels established in the Safe Drinking Water Act. Turbidity in the Willamette is low to moderate. Its mineral quality is similar to the Clackamas River.

Studies have identified fish deformities in the Newberg Pool area where the representative intake site is located. A relationship between water quality and this phenoma has not been established. The Oregon Department of Environmental Quality is now conducting sediment analyses in attempts to determine the source(s) of the fish deformities.

The water can be readily treated to meet Safe Drinking Water Act standards as documented in the Tualatin Valley Water District sponsored study. In addition, the drainage basin is large and has a fairly high dilution capacity in the mainstem. There are also a number of watershed management efforts beginning or underway throughout the Willamette basin.

According to the pilot treatment study, "a multiple barrier treatment process can successfully treat Willamette River water to meet stringent water quality and operational goals...and provide drinking water of excellent quality." Recommended treatment for the Willamette involves use of ozone for disinfection and oxidation, along with granular activated carbon (GAC) filtration for removal of trace organics. This approach to treatment would provide multiple barriers against both regulated and unregulated microbial and organic contaminants.

Key Environmental Issues

Fish - Development of a water supply system could have adverse impacts on fish populations. Impacts may occur due to changes in flow and potential entrapment, injury or death at the intake facility. Reduced flows during summer months could cause migration delays and associated straying and pre-spawning mortality. Oregon Chub is the only fish species on the Willamette River which is listed under the federal Endangered Species Act. Chub have not been observed in the lower mainstem since 1970 and are believed to exist in the tributaries. Several additional Willamette species have been petitioned for listing or as listed as species of concern.

Appropriate fish screening design can reduce fish impacts at the intake. Flow augmentation may be achievable to mitigate impacts by contracting for storage in Corps reservoirs upstream. The presence of salmonid fry and the potential for larval stage sturgeon, combined with low flow velocities may warrant the use of micro-screens or bypass facilities to foster safe fish passage. Enhancement of Seely Ditch and Wood Creek (located on the representative site) could also enhance fish resources.

Wetlands - Construction and operation of a Willamette River water supply system could result in enhancement of on-site riparian and wetland areas currently disturbed by the gravel operations. On-site construction is expected to be located within existing disturbed areas, thus minimizing the possibility of impacts to wetland and riparian areas. The effects on downstream wetlands and backwater areas due to reductions in flow are expected to be minor. There are several ways to avoid to mitigate impacts to wetland areas. These include creating an environmentally sensitive project design, revegetating of disturbed areas, and enhancing of wetland areas on-site or nearby. Other methods include reducing the level of diversion and/or augmenting flow with stored water from upstream Corps reservoirs.

Wildlife and Habitat - Development of a water intake and treatment facility could adversely affect wildlife and habitat at the representative site. Effects are expected to be minimal since construction could be concentrated in already disturbed areas. Those species potentially affected include deer, squirrels, bull frog, roughskin newts, song birds, red-tail hawk and raccoon. Impacts can be prevented in large part by designing the project to minimize disturbance, avoiding disturbance of stream corridor habitat on the site, and restoring existing disturbed areas.

Land Use - Potential water supply intake and treatment facilities are allowable under current land use and zoning designations. However, City of Wilsonville planning officials suggest that it would be most appropriate to rezone the site to a Public Facility Zone. The southern portion of the property is located in the Willamette Greenway which involves special development standards to ensure that the integrity and aesthetic quality of the natural environment is preserved. A possible mix of uses which has been suggested includes a treatment facility, designated trails, enhanced natural areas, public river access and a small community park.

A regional storage facility could be sited on Cooper Mountain with the issuance of a major conditional use permit and efforts to avoid ponderosa pine stands and headwater streams.

Costs

Costs of the project include both capital costs for design and construction, as well as ongoing varible costs to operate and maintain the facilities.

The capital costs to construct a for a 50 mgd Willamette River supply system are estimated to be about $264 million. A 100 mgd facility would costs about $378 million. The system would include a river intake, raw water pump station, raw water pipeline, treatment plant, finish water pump station, regional tranmission line, and regional storage. Power and chemical costs are estimated to be about $179 and $41 per million gallons, respectively. (Note: Variable costs may be subject to revision.)

Putting the Pieces Together

The Willamette River option will be evaluated, along with water conservation programs and other supply sources. The evaluation will involved comparing how well different resource combinations meet objectives for cost, reliability, water quality, environmental impacts, and other important policy issues. The preliminary plan (scheduled for completion in late July 1995) will present different resource combinations and associated tradeoffs for review by citizens and decision makers. The plan will then be finalized for regional adoption by the end of the year.

What You Can Do

If you would like additional information on how the Willamette River fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

Information Sources

From the list of interim reports produced for the Regional Water Supply - Plan project:

Murray Smith and Associates, *Evaluation of Water Rights and Water Use Permitting Requirements,* March 10, 1994.

Montgomery Watson, *Water Quality Analysis,* February 1994.

Montgomery Watson, *Water Treatment Analysis, May 1994.*

Montgomery Watson, *Surface Water Availability,* July 1994.

Parametrix, Inc., *Environmental Analysis of Future Water Source Options,* December 1994.

Other Sources:

Hegwald, Leslie, Mid-Willamette Valley Council of Governments, Personal Communication, May 11, 1995.

Montgomery Watson, *Willamette River Water Treatment Pilot Study,* prepared for the Tualatin Valley Water District, August 1994.

Oregon Water Resources Department, *Willamette Basin Report,* 1992

U.S. Geological Survey, *Statistical Summaries of Streamflow Data in Oregon: Volume 1 -- Monthly and Annual Streamflow and Flow-Duration Values,* Open File Report 90-118, 1990

Regional Water Supply Plan - Portland Metropolitan Area
Assessment of Water Reuse, Recycling, and Direct Use

What is the Regional Water Supply Plan?

Twenty-seven cities and water districts in the Portland metropolitan area, along with METRO, are developing a long-range water supply plan. The plan, due to be completed in late 1995, will provide strategies for meeting future water needs to the year 2050. The water providers are evaluating a host of water supply and conservation options to determine the best resource mix for the region.

Here in the Portland metropolitan region, along with many other parts of the United States, there is increasing interest in water reuse and recycling, and the direct use of stormwater and untreated river or groundwater. These types of supply options are typically considered for non-potable purposes, however in some parts of the country, they are also candidates for potable use.

The municipal water providers of the Portland metropolitan region are learning more about the opportunities by examining reuse, recycling, and stormwater as part of the Regional Water Supply Plan project. An overview of this analysis is provided below.

Potential Uses

Options which have been evaluated as part of the regional planning effort include:

- Stormwater capture
- Cisterns
- Gray water systems
- Recycling of industrial cooling water
- Reuse of treated wastewater effluent

As part of the Conservation and Demand Management element of the Regional Water Supply Plan project, qualitative and economic screenings were applied to the stormwater capture, cisterns, gray water systems and industrial water recycling options.

Qualitative Screen - The vast majority of conservation measures passed the first qualitative screening. Those passing included residential gray water systems, cisterns, and recycled cooling water. Eliminated from further analysis were gray water systems for commercial/landscape application and large scale stormwater storage/pump systems. The primary reasons for screening out these measures are summarized below.

Gray Water Systems for Commercial/Landscape Application - For purposes of this project, gray water is defined as untreated laundry, bath and bathroom sink water that has not come in contact with soiled diapers, meat or poultry. Gray water is typically considered for irrigation or other outdoor, non-potable or non-contact uses. In Oregon, using gray water as a supply source is not currently permitted. State regulations provide standards only for disposal of gray water in approved on-site septic systems, sumps, and sewage treatment systems. Various public health issues, regulatory changes, and consumer education would be required before gray water use would be allowed.

In a residential setting, gray water use may be appropriate given the small scale and ability of the resident to control how and when it is used at the

home. In a commercial setting, however, it is very difficult to control who comes into contact with gray water prior to entering or after leaving the system. Due to concern over potential health hazards, commercial gray water systems did not pass the qualitative screen and were eliminated from further evaluation under the Regional Water Supply Plan project.

Large Scale Stormwater Storage and Pump Systems - The Portland metropolitan region experiences rainy winters with substantial amounts of runoff after frequent, and often intense storms. Managing this stormwater is increasingly costly and complex due to recent, increasingly stringent regulations on water quality, surface water discharges, and combined sewer overflows (CSOs). Given the need for new water supplies, the Regional Water Supply Plan project team evaluated the potential use of captured stormwater to meet future demand.

As a result of the qualitative screening, large scale stormwater storage/pump systems were eliminated from further analysis. One primary reasons for screening out this option is the massive storage requirements. The storage requirements for large scale capture and use of stormwater would be extensive, involving large land areas and the construction of enormous pipes, tunnels, and/or reservoirs. In addition, even significant increases in in-town storage would provide only a few days additional supply.

Significant water quality issues would need to be addressed as well. Stormwater is generated when rain or melted snow runs off impervious or saturated surfaces into storm sewers, catchment basins, and local streams. This runoff contains numerous contaminants including petroleum by-products from roads, gas stations, and vehicle lots, fertilizers and pesticides from landscaped areas, and wastes from domestic and non-domestic animals. It can also contain contaminants washed from sites at which chemicals have been stored in leaking receptacles. CSO flows also contain raw sewage and associated pathogens.

Using this water for most non-potable purposes would probably require at least secondary if not tertiary treatment. Any in-town storage of water would need to be covered or otherwise treated to prevent algae growth and the proliferation of disease-spreading vectors such as mosquitoes.

Economic Screen - The purpose of the economic screening process was to compare the costs of water savings from individual conservation measures and non-potable sources with cost of water from potential future water supply options. A benefit-cost advantage was assigned to conservation measures during the screening process. This advantage was designed to account for benefits that are either difficult to quantify or have not yet been quantified (e.g., avoided enviromental impacts, energy use reductions, reduced demand on waste water treatment plants, etc.). Only those measures that were found to be clearly cost-prohibitive (i.e., costing 2.5 - 5 times higher than preliminary, "ballpark" estimates for potential new supplies) have been eliminated from further study.

Low -tech Graywater Systems - Low-tech gray water systems passed the economic screen. A low-tech gray water system is defined here as one providing 50 gallons per day via a 55 gallon drum which is connected to laundry facilities only. The water would be applied through drip irrigation with no leach field or backflow prevention device. However, based on additional analysis and examples from other areas, the potential for allowing gray water systems without backflow prevention devices appears extremely unlikely.

Heating, Ventilation and Air Conditioning (HVAC) and Industrial Recycling - The use of an air cooled rather than a water-cooled HVAC system was also found to be economically viable depending on the tonnage size. The cost-effectiveness of various industrial water recycling processes would need to be determined on a case-by-case basis.

Measures which did not pass the economic screen include high tech gray water systems and cisterns.

High-Tech Gray Water - The high-tech approach to gray water would involve larger systems with multiple sources (vs. laundry only), application via subsurface leach fields, and the use of backflow prevention devices. During the economic screen, the cost per unit of water provided from a high-tech gray water system was projected to be more than six and one-half times the estimated, per-unit cost of water from a new source. Thus, this technology was eliminated from further study for the remainder of the Phase 2 project.

Cisterns - Cisterns are rainwater collection devices that divert water from roof gutters into holding tanks or barrels which store the water for later use. An overflow device diverts the water back into the storm drain system once the tank or barrel is full. Rainwater is generally clean enough for all non-potable uses, although contamination can occur when water comes in contact with catchment surfaces. Other issues arise including regulations prohibiting "standing water," vector control, unforeseen use of cistern water for potable use, and aesthetics.

Water can be collected in the cistern system during the rainy season but would not be needed during much of the year. Water from the system would then be depleted rapidly during spring and summer, but the system would not regularly refill during the dry summer season when the water was most needed. Using the economic screening approach, the cost per unit of water provided from cisterns was found to range from 20 to 33 times more than the preliminary, per unit cost of "new water." Thus, this technology was recommended to be eliminated from further study.

Use of Treated Wastewater

The potential for using treated wastewater for non-potable purposes is also being evaluated as part of the Regional Water Supply Plan project. In Oregon, the Department of Environmental Quality regulates the use of treated effluent. For purposes of the Regional Water Supply Plan project, it is recommended that only Level IV, the highest quality of treated effluent should be considered to meet identified demands for non-potable supplies in the region. Level IV water can be applied to agricultural crops, including food crops, and to areas where public access is not controlled such as parks, green spaces, and golf courses with contiguous residences. The availability of water treated to Level IV would increase the potential reuse opportunities in the region.

Currently, two out of ten wastewater treatment plants (WWTPs) in the region provide the tertiary treatment required to meet Level IV effluent water quality standards. The Rock Creek and Wilsonville WWTPs have plant capacities of 20 mgd and 2.3 mgd respectively. The remaining eight plants have the capacity to provide secondary treatment for up to 176 mgd.

Based on existing information, there appears to be substantial markets for treated wastewater in the region. However, there remain considerable uncertainties, particularly in the key areas of costs and markets as shown in the following examples.

Preliminary studies show potential markets for up to 108.5 mgd of non-potable supplies in the current Bull Run service area and potential future Bull Run Service areas. Of that, 60 mgd was allotted for groundwater recharge and plume control at or near the Columbia South Shore Wellfield. Currently, remediation strategies are being evaluated and it is unclear if and how water injection fits into future remediation efforts.

The results of a Recycled Wastewater Master Plan prepared for the Unified Sewerage Agency estimated that reuse potential could reach up to about 75.0 mgd. However, the driving force behind this analysis was to identify readily available, low cost markets for treated wastewater and reduce effluent discharges to the Tualatin River. The study focused primarily on the application of treated wastewater to irrigated agricultural lands. More recently, water quality compliance issues have been addressed and the effort to keep effluent out of the river has been scaled back. Yet, a more focused analysis of potential feasibility of using treated wastewater specifically for non-potable municipal purposes Washington County could yield very different results than the previous analysis.

Treated wastewater is currently being used in the metro region currently. USA provides treated effluent from the Rock Creek Plant for irrigation at two golf courses, school fields, a dairy and a small, light industrial firm. USA is also discussing the option of using treated wastewater with water users in Washington County.

The City of Portland, Bureau of Environmental Services (BES) is exploring reuse options by constructing a facility at the Columbia Boulevard Treatment Plant that will provide Level III treated effluent for irrigation use at the site (currently provided by groundwater wells). The initial capacity will be 4 mgd. BES intends to expand the capacity to 12 mgd in the future. This facility will be used as a pilot/education project. It will provide technical information for use in future program decisions. In addition, BES has contracted to develop a facilities plan, part of which will focus on identifying reuse markets and opportunities until 2040.

Direct Use of Untreated Groundwater and Surface Water

Currently, the direct use of untreated groundwater and surface water ("direct use") is thought to play a key role in meeting non-potable demand in the region. The amount of direct use occurring at this time cannot be readily quantified. Yet, region-wide, it is likely that existing on-site or proximate, (non-municipal) groundwater wells and surface water diversions are used to meet significant irrigation (and some industrial) demands.

The Regional Water Supply Plan project does not include evaluation of regional water sources. For this project, it is assumed that the proportion of future water demand met through direct use will be the same as it is today. For the short-term, direct use systems are expected to be developed on a case-by-case basis at sites which are nearby or adjacent to available surface water and groundwater sources.

For example, the Port of Portland recently acquired municipal water use permits (rights) to use the waters of the Willamette and Columbia rivers for non-potable industrial and irrigation uses. Direct use by the Port should, over time, reduce the demand on the Bull Run potable water supply system substantially.

Given the potential benefits and efficiencies achieved by meeting non-potable demand with non-potable sources, it may be worthwhile for water providers to continue exploring direct use opportunities during implementation of the regional water supply plan.

Costs

The preliminary cost estimates for use of treated wastewater in the region vary widely. Current reports show the potential cost of treated effluent ranging from $700 - $44,300 per acre-foot. The wide ranges in cost estimates reflect different assumptions regarding the size of the market, type of treatment plant upgrades, and transmission and distribution requirements. Based on a 1993 national survey of municipal water providers using treated wastewater for irrigation uses, the per-acre-foot costs identified in the survey ranged from $300 - $2000. The cost estimates developed for reuse of wastewater from USA facilities are within the range of costs of similar types of systems examined in the national survey.

Preliminary estimates of potential markets for treated wastewater were also developed for Clackamas County. If about one-half of total estimated future park acreage and one-half of existing golf course area could be irrigated using reclaimed water, associated markets for the water would be approximately 5,000 acre-feet per year, or 9 mgd. Additional markets could probably be identified through a more detailed analysis of land use and future residential and commercial industrial/development potential.

In the Portland region, potential irrigation markets are expected to be seasonal in nature. More continuous demand could reduce unit costs for the treated wastewater. However, even in the south and southwest where irrigation markets for non-potable sources are nearly year-round, alternative discharge and/or storage facilities are still needed during low-demand periods (similar to what might be expected in Oregon).

One previous study projected costs of direct use (groundwater) to be lower than for reuse of Level IV treated wastewater. However, it may be difficult to obtain new water rights for surface water, or groundwater which is hydraulically connected to surface water. In addition, in portions of the region (e.g., Columbia River Basalt aquifer in Washington County) groundwater levels are declining and future uses of the resource are (or may become) restricted.

Coordination with Wastewater Management Agencies

The water providers participating in the Phase 2 planning effort have coordinated with the region's major wastewater management agencies at several work sessions and regularly scheduled meetings of the Metro Water Resources Policy Advisory Committee (WRPAC).

As mentioned above, continued coordination, research and pilot work will be needed to hone our understanding of the future role of water reuse and recycling in the Portland metropolitan region. As our understanding grows, the role of water reuse and recycling will be incorporated into the region's water supply future via plan updates over time.

What You Can Do

If you would like additional information on how water reuse and recycling fits into the Regional Water Supply Plan project, please contact your local water provider or the project management staff at 823-7528.

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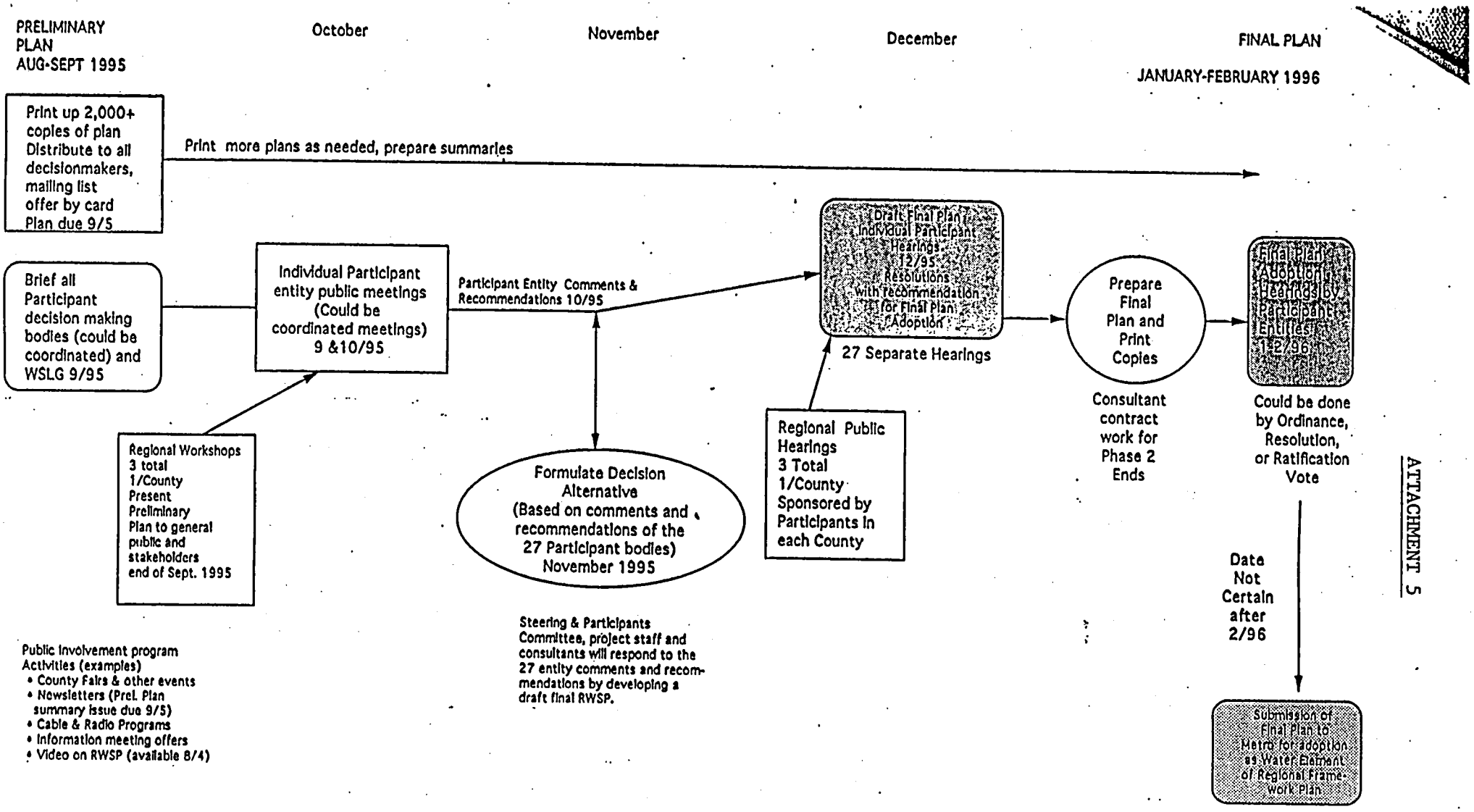


ATTACHMENT 5

EXECUTIVE SUMMARY

PRELIMINARY REGIONAL WATER SUPPLY PLAN
for the
Portland Metropolitan Area

August 1995

THIS PLAN WAS FINANCED AND MANAGED BY THE FOLLOWING PARTICIPANTS:

City of Beaverton
Canby Utility Board
Clackamas River Water
Damascus Water District
City of Fairview
City of Gladstone
City of Gresham
City of Hillsboro Utilities Commission
City of Forest Grove
City of Lake Oswego
Metro
City of Milwaukie
Mt. Scott Water District
Oak Lodge Water District
City of Portland
Raleigh Water District
Rockwood Water
City of Sandy
City of Sherwood
South Fork Water Board:
City of Oregon City/City of West Linn
Tigard Water District
City of Troutdale
City of Tualatin
Tualatin Valley Water District
West Slope Water District
City of Wilsonville
City of Wood Village

CONSULTANT TEAM:

Barakat & Chamberlin, Inc.
Montgomery Watson
Barney & Worth
Murray, Smith & Associates
Squier Associates
Parametrix, Inc.
McArthur & Associates
Pete Swartz

EXECUTIVE SUMMARY

HISTORY OF THE REGIONAL WATER SUPPLY PLANNING EFFORT

The Portland, Oregon, metropolitan region is located on the lower Columbia River, where the Willamette River joins the Columbia. Its urban area is made up of 3 counties and 24 cities with a combined 1990 population of 1,138,000. This population is growing.

The region is served by a number of different surface water and groundwater sources. The water supply system operated by the City of Portland currently supplies about 750,000 people; the rest are served by a variety of sources, most notably the Clackamas River, the Trask River/Tualatin River system, and groundwater.

In 1989, a number of the region's water providers convened to discuss future water supply issues. It was agreed that the region was going to face future supply shortfalls given current supplies, use patterns, and growth projections. A group called the Regional Providers Advisory Group (RPAG) was formed. It met on a monthly basis and had about 35 members.

The RPAG process has evolved into a regional water supply planning effort of unprecedented scope. Phase 1 of this effort, which was completed in 1992, found that:

- Water demands would increase significantly throughout the region;
- Existing supplies would not meet all of these demands;
- Conservation could play an important role in meeting regional water needs; and
- New sources of water and efficient transmission systems offered the potential to meet these increasing needs.

The Phase 1 "Water Source Options Study" evaluated 29 different water supply options that could potentially be developed to serve the Portland/Vancouver metropolitan area's water needs and ranked these sources against a predetermined set of criteria. The evaluation concluded that six supply source options were worthy of additional analysis and should be carried forward to a second phase Regional Water Supply Plan (RWSP). The six source options are:

- A third dam in the Bull Run Watershed;
- Additional diversion and treatment capacity on the Clackamas River;
- Diversion and treatment capacity on the Willamette River;
- Diversion and treatment capacity on the Columbia River;
- Raising the height of Barney Dam on the Trask River, thereby increasing the storage capacity of Barney Reservoir; and
- Aquifer Storage and Recovery, involving the use of one or more of the region's surface water sources.

Since the completion of Phase 1, the Joint Water Commission and the Tualatin Valley Water District have continued to pursue the Barney Reservoir option[1] and have initiated construction on that project. The RWSP therefore focuses on the remaining five supply options.

The RWSP also considers water conservation as a key resource option.

This document reports on the results of the RWSP. Phase 2 was funded and managed by a group of 27 water providers in the metropolitan region.[2] In 1994, the Metropolitan Service District (Metro) became the 28th participant. The project used the techniques of Integrated Resource Planning and was conducted by a team of consultants led by the firm of Barakat & Chamberlin, Inc. Following is a list of the project participants:

City of Beaverton*
Canby Utilities Board
Clackamas Water District**
City of Gladstone
Clairmont Water District**
Damascus Water District
City of Fairview
City of Gresham
City of Hillsboro Utilities Commission*
City of Portland
Raleigh Water District
Rockwood Water PUD
City of Sandy
City of Sherwood
South Fork Water Board
City of Tigard
City of Troutdale
City of Tualatin

[1]An Environmental Impact Statement was being developed for this project before Phase 2 began.

[2]The City of Vancouver and Clark County, Washington chose not to participate in Phase 2. The Phase 2 participants are all Oregon jurisdictions.

City of Forest Grove*
City of Lake Oswego
City of Milwaukie
Mt. Scott Water District
Oak Lodge Water District
Tualatin Valley Water District*
West Slope Water District
City of Wilsonville
City of Wood Village
Metropolitan Service District (Metro)

*Denotes members of the Joint Water Commission.
**The Clackamas and Clairmont Water Districts have recently merged to form Clackamas River Water.

SCOPE OF THE PHASE 2 REGIONAL WATER SUPPLY PLAN

The scope of the Regional Water Supply Plan (RWSP) is comprehensive. It includes the following major elements:

(1) An active and ongoing **public information and involvement** program.

(2) Development of **policy objectives** that reflect the important regional values that this plan must attempt to meet.

(3) Development of a logical and defensible **demand forecast** for the region.

(4) Evaluation of five potential **supply sources.**

(5) Identification and evaluation of possible **transmission system improvements and expansions.**

(6) Identification and evaluation of a broad range of voluntary and mandatory **demand management and conservation options** available to the region.

(7) Development and evaluation of **integrated resource strategies** based on the information developed in the foregoing elements. A sophisticated modeling tool was developed to assist this process.

(8) Identification of **short-term and long-term actions** that the region must undertake to ensure that the needs of the regional water providers and

their customers are met throughout the planning period, which runs through the year 2050.

This report contains the preliminary results of the RWSP. The plan is "preliminary" at this point because of the critical need for public feedback over the next several months on the report contents. Based on that input, the plan will be finalized in early 1996.

Chapters of the preliminary plan document provide descriptions of all RWSP elements. For most of these, more detailed documentation has been prepared over the course of the project in the form of interim reports or technical memoranda. These are listed in Appendix A of the plan. Arrangements to review these documents may be made through participating water providers.

THE REGION'S NEED FOR NEW RESOURCES

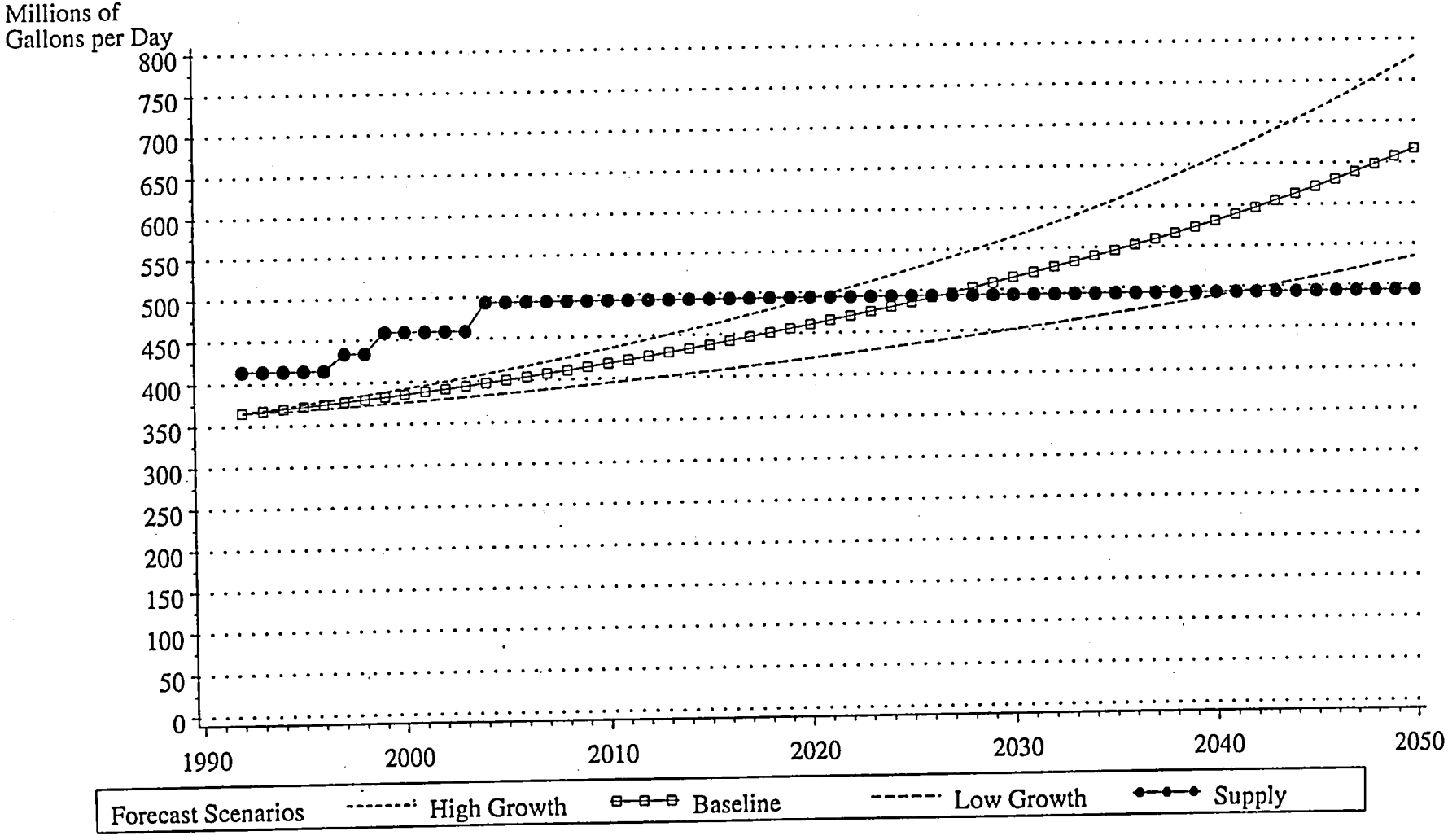
A key conclusion of the RWSP is that, *with current resources and facilities supplemented by the resource additions to which the region's providers have already committed, the earliest point at which the region will need major new supply additions will be around the year 2017.* This point is illustrated in Figure ES-1, which shows a simple comparison between available supplies and peak-day demands under extreme weather conditions, assuming no utility-sponsored conservation programs. An active conservation effort by providers can put off this need until at least the early-to-mid 2020s.

This does not imply that there is no work to be done until that time. *There is, in fact, much to be done in the near-term to ensure that the region meets the needs of its water customers.* Some of these near-term actions include the timely completion of resource additions to which the regional providers have committed, development of necessary transmission and interconnection facilities to meet the needs of all providers, conservation program planning and implementation, and design of a suitable institutional and financial structure to govern the delivery of water service in the region.

Figure ES-1

Comparison of Regional Peak-Day Demand To Existing and Committed Supply

Portland Metropolitan Region
1992--2050: All Customer Classes



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PUBLIC INVOLVEMENT IN THE REGIONAL WATER SUPPLY PLANNING PROCESS

Public information and involvement (PI&I) has been a cornerstone of the RWSP. Water provider participants demonstrated their commitment to PI&I by making it a key element of the project's scope, Substantial fiscal and staff resources have been dedicated to ensuring that the values of the citizenry are understood and heard.

From its inception, the RWSP was designed to obtain input from various audiences through a mix of activities. Some activities targeted the general regional population, while others involved those with specific interests. Through this process, providers also attempted to promote consensus-building concerning the process and findings of the Plan.

Vehicles used to obtain that input and inform the public about the project have included:

- A broad range of written materials made available to the public;
- A variety of workshops, roundtable discussions, and public forums;
- Over 80 interviews of key stakeholders in the region;
- A detailed public opinion research study;
- A survey to assess the value that customers place on water supply reliability;
- More than 100 presentations to interested agencies, organizations, and citizens;
- Various newsletters, informational materials, and bill inserts;
- An Environmental Task Force of environmental organization representatives and government officials to review the environmental analysis;
- Exhibits at county fairs in Multnomah, Clackamas, and Washington counties;
- Two focus groups with residential water customers;

- A slide show on the RWSP; and
- A 15 minute RWSP video.

Thus, there has been, throughout the planning process, a great deal of information exchanged between project participants and interested citizens, organizations, and decision makers. Over 300 persons receive regular notification of committee meetings and documentation of ensuing discussions. Approximately 3,300 citizens receive updates and invitations to submit feedback through newsletters and other information pieces related to the project. Many customers have received bill inserts on the RWSP process. In turn, project participants have received input from over 3,200 people through surveys and public workshops or briefings.

Participating providers made it a priority to *listen to the public*. Several key public values and priorities have emerged from the PI&I effort. The issues that people most care about include:

- Cost
- Equity
- Water quality
- Environmental protection
- System reliability
- Efficient water use
- Implications of growth

Not surprisingly, these key issues reflect the diverse interests of the region's citizenry. The goal of the public involvement process has been to capture the range of interests and concerns held throughout the region.

REGIONAL POLICY OBJECTIVES

The PI&I efforts provided key input to the development of a set of regional policy objectives developed specifically for the RWSP. The policy objectives, along with associated evaluation criteria, provide a framework to design and evaluate the relative strengths and weaknesses of alternative resource configurations.

The region's water providers have not attempted to prioritize the policy objectives. This is consistent with not providing a single "best" resource plan. Rather, the plan presents several options that emphasize different sets of objectives. The plan makes

tradeoffs among these options clear. The region must now make choices among these alternatives.

Some of the policy objectives complement each other, while others compete or conflict. The complexity of the water supply planning and decision-making process is appropriately reflected in the broad range of policy objectives identified.

The policy objectives include:

Efficient Use of Water

- Maximize the efficient use of water resources, taking into account the potential for conservation, availability of supplies, practicality, and relative cost-effectiveness of the options.

- Make the best use of available supplies before developing new ones.

Water Supply Reliability

- Minimize the frequency of water shortages of any magnitude and duration.

- Ensure that the duration and magnitude of shortages can be managed (e.g., through the operation of raw water storage facilities or through access to alternative sources of water).

Water Quality

- Meet or exceed all current federal and state water quality standards for finished water.

- Utilize sources with the highest raw water quality.

- Maximize the ability to protect water quality in the future, including using watershed-protection based approaches.

- Maximize the ability to deal with aesthetic factors, such as taste, color, hardness, and odor.

Impacts of Catastrophic Events

- Minimize the magnitude, frequency, and duration of service interruptions due to natural or human-caused catastrophes, such as earthquakes, landslides, volcanic eruptions, floods, spills, fires, sabotage, etc.

Economic Costs

- Minimize the economic impact of capital and operating costs of new water resources on customers.

- Assure the ability to relate rate impacts associated with new water resources to benefits gained within the region on an equitable basis over time.

Environmental Impacts

- Minimize the impact of water resource development on the natural and human environments.

Growth

- Be consistent with Metro's regional growth strategy and local land-use plans.

Flexibility to Deal with Future Uncertainty

- Maximize the ability to anticipate and respond to unforeseen future events or changes in forecasted trends.

Ease of Implementation

- Maximize the ability to address local, state, and federal legislative and regulatory requirements in a timely manner.

Operational Flexibility

- Maximize operational flexibility to best meet the needs of the region, including the ability to move water around the region and to rely on backup sources as necessary.

Comparisons and tradeoffs among alternatives are facilitated through a set of measurable *evaluation criteria*. Each policy objective is associated with one or more evaluation criteria. Each alternative resource strategy is evaluated against these criteria.

FUTURE WATER DEMANDS IN THE REGION

A well-developed and defensible water demand forecast is critical to the RWSP. The demand forecast underlies the entire planning effort. The RWSP demand forecast was a complex undertaking that projected annual, seasonal, monthly, and peak-day demands for the region as a whole and for each of the three counties. These projections are based on demographic and employment forecasts developed as part of Metro's Region 2040 project. RWSP staff and consultants have coordinated closely with Metro staff throughout the process to ensure consistency.

Tables ES-1 through ES-3 summarize the forecasting results for annual average, summer average, and peak-day demands respectively. The 1992 base demands are shown, as are the high, medium, and low demand forecasts for the year 2050, the last year of the planning period. Average annual growth rates over the planning period are also shown.

These demands reflect naturally-occurring conservation, which results from legal, regulatory, and market forces which tend to increase water efficiency over time regardless of any utility conservation programs.

Table ES-1
ANNUAL AVERAGE WATER DEMAND FORECAST (MGD) AND AVERAGE ANNUAL GROWTH RATES

	1992	2050: High	2050: Medium	2050: Low
Region	172	310 (2.1%)	264 (1.5%)	211 (0.7%)
Multnomah County	97	144 (1.4%)	126 (0.9%)	106 (0.3%)
Clackamas County	33	67 (2.6%)	56 (1.9%)	43 (0.9%)
Washington County	42	99 (3.1%)	82 (2.4%)	62 (1.4%)

Table ES-2
PEAK SEASON WATER DEMAND FORECAST (MGD) AND AVERAGE ANNUAL GROWTH RATES

	1992	2050: High	2050: Medium	2050: Low
Region	220	417 (2.3%)	350 (1.7%)	275 (0.8%)
Multnomah County	123	190 (1.6%)	165 (1.1%)	136 (0.4%)
Clackamas County	41	90 (2.8%)	74 (2.1%)	56 (1.1%)
Washington County	56	137 (3.2%)	111 (2.5%)	84 (1.5%)

Table ES-3
PEAK DAY WATER DEMAND FORECAST (MGD) AND AVERAGE ANNUAL GROWTH RATES

	1992	2050: High	2050: Medium	2050: Low
Region	365	780 (2.7%)	667 (2.2%)	535 (1.4%)
Multnomah County	183	305 (1.8%)	269 (1.4%)	227 (0.8%)
Clackamas County	87	221 (3.4%)	185 (2.7%)	144 (1.8%)
Washington County	96	255 (3.6%)	213 (2.9%)	164 (1.9%)

CURRENT AND COMMITTED RESOURCES

Existing water systems in the region have an estimated usable storage capacity of 11.4 billion gallons and a delivery capacity of 413.8 million gallons per day (mgd). Current regional peak-day demand, even under weather conditions that approach the hottest and driest that the region has experienced over a 65-year historical period of record, is about 370 mgd. Despite this apparent excess capacity, some individual providers within the region do face more immediate shortfalls due to transmission and distribution system constraints.

Existing water sources and facilities for the region include:

- **The Bull Run watershed,** with two dams that impound 10.2 billion gallons of usable storage. About 750,000 residents of the region rely on the Bull Run as their primary supply.

- **The Clackamas River,** on which regional providers have developed 66 mgd of intake and treatment capacity. The Clackamas is currently the primary source of water to 175,000 residents.

- **The Trask/Tualatin water system,** which includes the 1.3 billion gallon Barney Reservoir on the Trask River, a conduit from the reservoir to the Tualatin River, and 43.5 mgd of intake and treatment capacity on the Tualatin. In addition, in most years, the region has access to 4.2 billion gallons from Hagg Lake, which is owned by the Bureau of Reclamation and located on Scoggins Creek. This system supplies water to over 120,000 residents in the western part of the region.

- **The Columbia Southshore Wellfield,** which was developed in the 1980s as an emergency backup and peaking supply source. Since 1986, the ability to use the wellfield has been limited to prevent migration of contamination plumes. As a result, the current usable delivery capacity of the wellfield is assumed to be 35 mgd. The City of Portland is working closely with the Oregon Department of Environmental Quality and with the responsible parties to implement a remediation program that restores the wells to their full capacity of up to 90 mgd.

- **Local sources,** which are used by a number of smaller communities in the region for base use or peaking purposes. These are largely

groundwater sources scattered throughout the region and provide nearly 60 mgd of capacity.

- **Transmission lines**, which range from 4-inch diameter pipes in small districts to the 66-inch diameter Bull Run Conduit No. 4.

In addition to maintaining existing water supply sources and transmission facilities, the region's water providers are committed to completing several facility additions, expansions and improvements over the next two to ten years. The projects will provide another 80 mgd of delivery capacity and 5.2 billion gallons of storage. These additions are not being evaluated as part of the Regional Water Supply Plan. Rather, the RWSP assumes these projects will be completed, and includes them in the plan's baseline resource assumptions or "base case".

Resources to which regional providers have committed, but which are not yet operational, include:

- **The Barney Reservoir expansion**, which will increase the water storage capacity of Barney Reservoir from 1.3 billion gallons to 6.5 billion gallons. This project is expected to be completed by 1998. In addition, improvements to the Joint Water Commission's intake and treatment facilities on the Tualatin River and addition of a new transmission line are expected to increase delivery capacity by 20 mgd to 63.5 mgd by 1997.

- **Additional Clackamas River capacity** beyond the 66 mgd that already exists. Several Clackamas providers have committed to developing a total of 22.5 mgd of additional capacity. This would bring the total "base case" capacity on the Clackamas to 88.5 mgd.

- **Columbia South Shore Wellfield enhancements**, which the RWSP assumes will increase the current 35 mgd of capacity to 72 mgd by 2005.

Table ES-4 summarizes the existing and committed resources being assumed in the RWSP "base case."

As discussed earlier, these committed resources enable the region to defer the need for further resources or facilities until at least the year 2017. Without these committed additions, needs can occur as early as 2004.

Table ES-4
REGIONAL WATER SUPPLY PLAN
EXISTING AND COMMITTED SUPPLY SOURCES

Source	Existing		Additional Committed		Existing and Committed	
	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)
Bull Run Res 1,2	**210**	**10,200**			**210**	**10,200**
Clackamas						
CRW	30				30	
SFWB	20		10		30	
Lake Oswego	16		4		20	
Oak Lodge			8.5		8.5	
Subtotal	**66**		**22.5**		**88.5**	
Trask/Tualatin	**43.5**	**1,153**	**20**	**5,214**	**63.5**	**6,367**
Southshore Wellfield	**35**		**37**		**72**	
Local Sources						
South	28.4				28.4	
West	12.8				12.8	
East	18.1				18.1	
Subtotal	**59.3**				**59.3**	
Total	**413.8**	**11,353**	**79.5**	**5,214**	**493.3**	**16,567**

ANALYSIS OF SOURCE OPTIONS

For each source option, possible facility locations were screened to identify **representative sites**, which the RWSP defines as:

> *Potential facility locations that merit detailed analysis because they offer the highest likelihood of successful permitting and potential development based on preliminary analyses of technical, land use, water quality, environmental, cost, and other relevant factors.*

Identified representative sites are as follows:

- **Bull Run Dam 3:** Bull Run River canyon just downstream of Log Creek and about one-half mile downstream of the confluence of Blazed Alder Creek and the Bull Run River.

- **Clackamas River:** A consolidated facility adjacent to the current Clackamas River Water site.[3]

- **Willamette River:** Just upstream (west) of the existing railroad bridge in Wilsonville on the north side of the river on property currently owned by Oregon Pacific which is currently used for sand and gravel operations.

- **Columbia River:** Just below the Sandy's mouth, on a site currently used for gravel mining and storage.

- **Aquifer Storage & Recovery:** Two sites, one in the Powell Valley area southeast of Gresham and the other in the Cooper-Bull Mountain area about four miles to the southwest of the City of Beaverton in Washington County.

Extensive analyses of each option were then performed. Areas analyzed include:

- Water Availability and Water Rights
- Raw Water Quality and Treatment Requirements
- Environmental Impacts
- Vulnerability to Catastrophic Events

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[3]Several configurations were considered that use this consolidated facility instead of or in conjunction with the various existing or planned Clackamas River facilities.

- Costs
- Ease of Implementation

One of the key conclusions is that all of the surface sources can readily be treated to meet or surpass all safe drinking water standards.

These analyses formed the basis of ratings of each option against key evaluation criteria and provided crucial information to the development and assessment of alternative resource strategies. Table ES-5 summarizes the ratings of the source options.

ANALYSIS OF TRANSMISSION OPTIONS

In addition to the source options, transmission is critical to efficiently meeting the region's needs. The region's transmission systems include several components, including:

- Pipelines that move treated water from the treatment plant to the regional storage reservoirs;
- The regional reservoirs themselves;
- Major lines linking sources to demands in other parts of the region;
- Major lines designed to serve demands within a portion of the region; and
- Local "spokes" to serve the needs of individual providers.

Representative regional reservoir sites for the surface source options are as follows:

- Bull Run and Columbia sources: Existing Powell Butte reservoir site.
- Clackamas source: Forsythe Road site near the unincorporated community of Outlook in Clackamas County.
- Willamette source: Cooper Mountain site in unincorporated Washington County west of Beaverton.

Nine major representative transmission corridors were identified, as follows:

- Lusted Hill/Powell Butte
- Columbia River/Powell Butte
- Powell Butte/Clackamas River
- Powell Butte/Beaverton
- Clackamas/Tualatin
- Clackamas/Forsythe Road
- Willamette/Tualatin
- Tualatin/Beaverton
- Cooper Mountain/Beaverton

Corridor alignments were chosen for each of these based on preliminary land use, environmental, and geotechnical analyses. Based on specified design criteria, cost functions were then generated for each corridor. These cost functions also included base cost estimates for the local "spokes" between the corridor and the appropriate local providers.

The final components of the transmission system are the "spokes" that deliver water to the local providers from one of the major transmission lines. For each provider, these spokes were sized to meet the projected 2050 demand deficit based on forecasted high peak-day demands. As discussed below, *a key plan implementation issue for the region is the specific local interconnections that are needed to ensure that provider needs are met in the near-term as well as the long-term.* The region should attempt to configure these local transmission additions to be consistent with the adopted long-term regional resource strategy.

Table ES-5
RATINGS OF SOURCE OPTIONS

Source Option	Natural Environment	Human Environment	Raw Water Quality	Water Aesthetics	Watershed Protection	Vulnerability to Catastrophic Events	Ease of Implementation
Bull Run Dam 3	4.9	3.6	1.2	1.0	1.0	3.5	4.5
Columbia	2.6	2.5	2.1	2.5	5.0	3.3	3.5
Willamette	1.0	2.5	2.2	2.0	4.0	2.5	4.0
Clackamas (>50 mgd)	2.4	1.0	1.8	2.0	2.0	2.5	2.0
Clackamas (≤ 50 mgd)	1.0	1.0	1.8	2.0	2.0	2.5	2.0
ASR	1.5	2.2	3.0	3.0	N/A*	2.0	3.0

Note: Ratings range from 1 to 5; lower scores are preferred.
* This issue was not directly addressed in the RWSP. It is assumed that rigorous wellhead protection programs will be required for any ASR site.

It is critical that the development of regional, subregional, and local transmission options meets local needs over the entire planning period in a manner consistent with the region's anticipated ultimate resource configuration. At times, there will be some friction between short-term local needs and long-term regional needs. The manner in which this friction is resolved must recognize that a regional plan that cannot flexibly meet the ongoing needs of the participant providers will not retain the critical support of those providers. These needs should, however, be met in the context of the strategic direction the region has chosen.

ANALYSIS OF CONSERVATION PROGRAMS

A basic premise of the RWSP is that water conservation is a resource that can play a key role in meeting future water needs and that this resource must be carefully considered and subjected to the same level of analysis as are supply sources. A comprehensive framework was used to examine water conservation to assure that all viable conservation technologies and management practices are considered.

The framework began by specifying a large universe of potential conservation measures. These measures were then subjected to a qualitative screen to narrow the focus to those that had potential value to the region. For those measures that passed the qualitative screen, technology profiles were developed that described each measure's key technical and economic characteristics. The profiles formed the basis of an economic screen of the remaining measures.

The next step was to combine measures passing both screens into effective conservation program concepts. A conservation program is a set of conservation measures bundled for delivery to a defined target market of customers. The results of this step are presented in Table ES-6, in which the program concepts are divided into three levels in increasing order of "aggressiveness." Detailed descriptions were developed for each of 24 program concepts. In addition, estimates were made of the further savings that could be achieved through conservation pricing programs beyond those already in place in the region.

The RWSP also included a preliminary analysis of opportunities for increasing water reuse and recycling, and for the direct use of stormwater. Options evaluated include:

- Stormwater capture
- Cisterns
- Gray water systems

- Recycling of industrial cooling water
- Reuse of treated wastewater effluent

DEVELOPMENT OF ALTERNATIVE RESOURCE STRATEGIES

The final product of the RWSP is a set of *resource strategies* that best meet the region's needs as expressed through the policy objectives. There are many possible strategies that reflect the tradeoffs the region must make among the policy objectives.

In light of the importance of future uncertainties, it is useful to distinguish between a *resource sequence* and a *resource strategy*.

- A *resource sequence* is a linear progression of resource and transmission additions over the planning period. Note that a resource sequence does not provide flexibility for the region. It is a single development path that does not respond to changing future conditions.

- A *resource strategy* is a multi-branched "tree" of sequences that defines actions that should be taken under various sets of uncertainty outcomes. It is a "road map" of recommended actions under a wide range of future conditions, and provides a series of points at which the region can respond to new information about then-current conditions.

Table ES-6
REGIONAL CONSERVATION PROGRAM CONCEPTS

	Residential Indoor	Residential Outdoor	Commercial, Industrial, Institutional Indoor	Commercial, Industrial, Institutional Outdoor
Level 1	Public education and awareness	Public education and awareness Customer landscaping workshops Trade ally landscaping workshops—res. portion	Commercial plumbing and appliances education HVAC workshops	CI&I outdoor education and awareness C&I watering practices workshops Trade ally landscaping workshops—C&I portion
Level 2	Indoor audit (combined with outdoor) Appliance incentives and equipment tagging	Outdoor audits Incentives for new efficient landscaping and irrigations systems	Commercial indoor audit HVAC financial incentives Industrial process technical assistance and incentives	CI&I outdoor audits Large landscape audits Incentives for new efficient landscaping and irrigation systems
Level 3	Ultra low-flush toilet rebate	Landscaping ordinance	Ultra low-flush toilet direct installation and incentives Incentives for early retirement of single-pass cooling	Landscaping ordinance

Water Supply Reliability

One of the fundamental goals of the RWSP is to address the issue of water supply reliability. This goal is embodied in the policy objective of "minimiz(ing) the frequency of water shortages of any magnitude and duration." In many ways, supply reliability is basic to the RWSP, as concern about future *un*reliability is the key reason the region's providers joined to develop the plan.

The region must ultimately choose a desired level of future reliability, just as it must make choices about other policy objectives. Tradeoffs occur between increased reliability levels and other important objectives, such as minimizing costs and environmental impacts. Policymakers must understand the consequences of different reliability levels to make informed decisions. To accomplish this, resource sequences and strategies were defined for each of three reliability levels.

The definition of these reliability levels was guided by the key finding that, given existing and committed resources, the Portland region will have sufficient total water supply volumes to avoid all *volume-related* shortages for the entire planning period (i.e. through 2050), even under high demand and low flow conditions. However, in the absence of further resource and facility additions, the region will face *shortages in delivery capacity* on high-demand days.

Since the region must concern itself with shortages in delivery capacity that are driven by peak demands, the alternative reliability levels should be defined accordingly. Thus, the key distinctions in reliability relate to the level and frequency of shortages during peaking events.

- A system that achieves **Level 1 reliability** would be perfectly reliable. No shortages would be experienced even under the worst historical weather conditions.

- A system that achieves **Level 2 reliability** would allow for no more than a 10% peak day shortage for any of the three counties under the worst historical weather conditions.

- A system that achieves **Level 3 reliability** would allow for no more than a 20% peak day shortage for any of the three counties under the worst historical weather conditions.

Resource Sequences That Achieve Level 1 Reliability

There are many ways for the region to add resources and facilities to ensure that future shortages do not occur. The RWSP proposes five approaches to meeting the region's needs and achieving this highest possible level of reliability. Each of these five sequences was designed to emphasize different policy objectives or combinations of objectives. Table ES-7 provides a guide to the key policy objectives addressed by each sequence. The sequences themselves are illustrated in Figure ES-2. Each of these sequences assumes high demands.

These resource sequences were evaluated against the evaluation criteria. Table ES-8 shows the results of the key assessments.

Table ES-7
KEY POLICY OBJECTIVES
ADDRESSED BY LEVEL 1 RESOURCE SEQUENCES

Sequence	Natural Environment	Water Use Efficiency	Raw Water Quality	Costs	Catastrophic Events
1.1	✓	✓			
1.2		✓	✓		
1.3		✓	✓	✓	
1.4		✓			✓
1.5	✓	✓		✓	✓

Table ES-8
PERFORMANCE OF LEVEL 1 RESOURCE SEQUENCES AGAINST KEY EVALUATION CRITERIA

Sequence	Cost		Efficiency: % Conservation Savings for Planning Period	Natural Environment*	Water Quality		Catastrophic Events			Ease of Implementation*
	Present Value Societal ($ millions)	Present Value Utility ($millions)			Raw Water Quality*,†	Watershed Protection*	Expected Seasonal Unserved Demand in Worst Year Without: Bull Run	Expected Seasonal Unserved Demand in Worst Year Without: 2nd Largest Source	No. of New Sources	
1.1 Natural Environment/ Efficiency	996.6	962.9	10.57%	1	2.2	2.1	23%	1.5%	1	2.5
1.2 Raw Water Quality/Efficiency	722.2	802.6	5.04%	4.9	1.2	1.3	60%	0.7%	0	4.5
1.3 Cost/Water Quality/Efficiency	611	647.6	5.04%	3.2	2	2.1	16%	9.0%	1	3.1
1.4 Catastrophic Events/Efficiency	635.1	673.9	5.04%	2.9	2.2	2.1	2%	0.7%	3	3.8
1.5 Costs/Natural Environment/ Catastrophic Events/Efficiency	647.9	673.9	5.04%	2.1	2.2	1.8	2%	0.9%	2	3.3

* Comparative scale ranging from 1–5 with 1 as the most favorable rating and 5 as the least favorable rating.
† Volume weighting of raw water quality ratings of new sources.

Resource Strategies That Achieve Level 1 Reliability

For each of the five sequences, associated resource strategies that reflect demand uncertainty were developed. These strategies indicate how future resource and facility development activities would vary as future demands deviate from earlier forecasts. In all cases, the objective would still be to achieve Level 1 reliability. To illustrate, a resource strategy diagram is shown in Figure ES-3.

Table ES-9 shows the expected values of the key evaluation ratings for each of the strategies.[4] The flexibility rating is based on the number of possible resource paths in the strategy.

[4]These expected ratings are based on assumed probabilities for each possible demand outcome (high, medium, or low) for the successive demand reassessments that occur throughout the planning period.

Table ES-9
EXPECTED VALUES OF KEY EVALUATION CRITERIA FOR LEVEL 1 STRATEGIES

Strategy	Costs		Natural Environment*	Water Quality		Flexibility*
	Present Value Societal ($million)	Present Value Utility ($million)		Raw Water Quality*	Watershed Protection*	
1.1 Natural Environment/Efficiency	864.3	797.8	1.0	2.0	1.8	3
1.2 Raw Water Quality/Efficiency	580.6	619.9	4.1	1.2	1.2	5
1.3 Costs/Water Quality/Efficiency	494.0	501.4	2.2	1.7	1.7	3
1.4 Catastrophic Events/Efficiency	534.4	546.9	2.2	2.1	1.7	1
1.5 Costs/Natural Environment/ Efficiency/Catastrophic Events	539.9	539.9	1.8	2.1	1.5	2

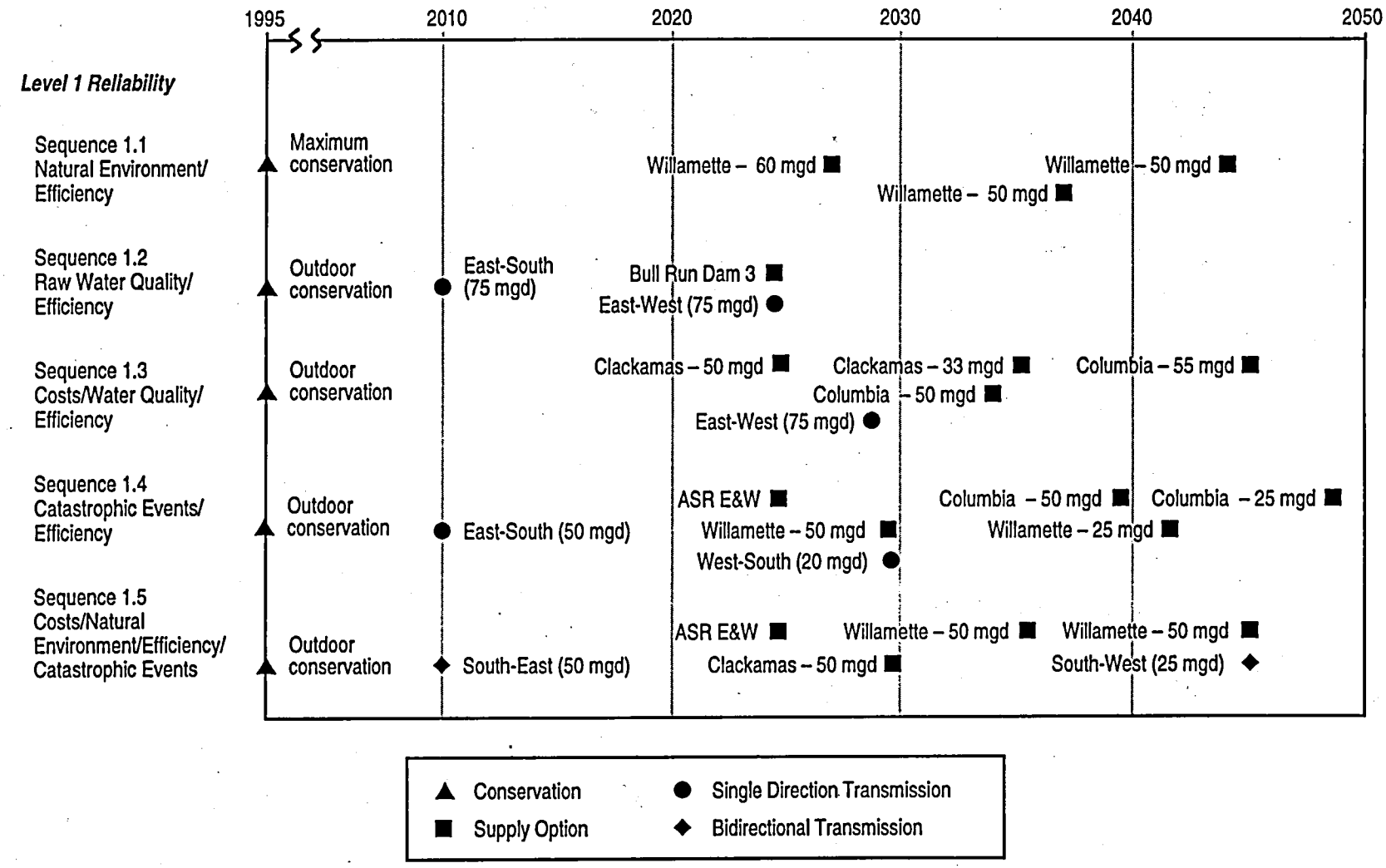
*Comparative scale ranging from 1–5 with 1 as the most favorable rating and 5 as the least favorable rating.

Implications

As mentioned earlier, these results indicate that—even if the region were to pursue the highest possible level of reliability and future demands turn out to be high—major resource additions would not be required until well into the 2020s. This conclusion assumes that the region pursues a menu of conservation programs that focus on outdoor uses and is critically dependent on the region's developing committed sources in a timely manner. If the region undertakes those near-term activities, there is considerable time before additional sources must be developed.

Figure ES-2

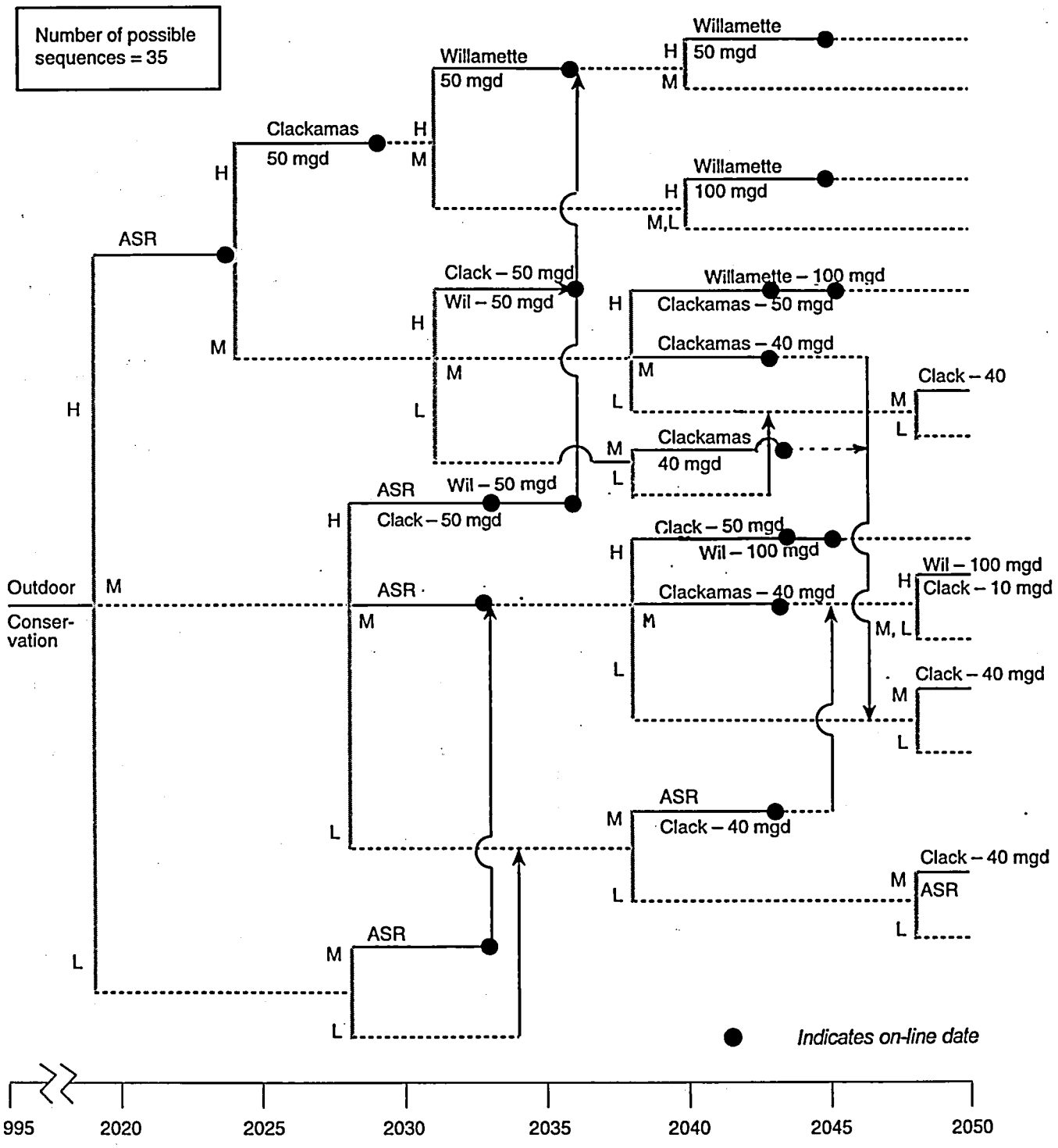
Level 1 Resource Sequences–High Demand



95-920293.portl.bet.7/95.ap

Figure ES-3

Level 1 Reliability – Strategy 1.5



95-920293.Fig.XI-18.7/95.fh

This does *not* mean the region can afford to defer a decision on which resource strategy will be pursued. As discussed below, the region faces many challenges in the short-term that will require action to ensure the needs of individual providers will be met. Policymakers' adoption of a long-term resource strategy will provide important direction to water providers, guiding near-term actions such as regional conservation program implementation and additions to the region's transmission system.

Resource Strategies that Achieve Level 2 or 3 Reliability

It is important to understand the implications of the region choosing less-than-perfect reliability, particularly in terms of costs. To illustrate, Level 2 and 3 strategies were developed that correspond to Level 1 strategies 1.2 and 1.5. Table ES-10 contains the mean values of key evaluation indices for these four new resource strategies. Their expected costs are significantly less than for their Level 1 counterparts. This key tradeoff between costs and reliability is one of many such tradeoffs that the region must make.

Table ES-10
EXPECTED VALUES OF KEY EVALUATION CRITERIA FOR LEVEL 2 AND 3 STRATEGIES*

Strategy	Costs		Natural Environment**	Water Quality**		Flexibility**
	Present Value Societal ($million)	Present Value Utility ($million)		Raw Water Quality**	Watershed Protection**	
2.2 Raw Water Quality/Efficiency	517.2	537.2	3.7	1.1	1.3	5
2.5 Costs/Natural Environment/ Efficiency/Catastrophic Events	494.1	487.8	1.8	2.0	1.5	3
3.2 Raw Water Quality/Efficiency	481.9	490.9	3.7	1.1	1.3	5
3.5 Costs/Natural Environment/ Efficiency/Catastrophic Events	476.2	462.9	1.7	2.2	1.4	5

*Probability-weighted averages across all possible resource development paths.
** Scale ranging from 1–5 with 1 as the most favorable rating and 5 as the least favorable rating.

CONCLUSIONS AND RECOMMENDATIONS

A regional dialogue regarding the appropriate future level of water supply reliability should be undertaken. Yet, that decision does not have to be made before going forward with required near-term actions since the major impact of lesser reliability levels is to put off necessary resource additions even further. At the appropriate time, the region's decision makers must determine the desirable level of reliability for the region.

While long-term system reliability does not influence near-term actions, many of the near-term actions the region must pursue *will* be affected by resource choices pursued over the long-term. Thus, it is critical for the region to consider the five strategies presented for Reliability Level ,1 and to select one of these or develop an alternative.

Based on the evaluation of Strategies 1.1 through 1.5, the regional providers suggest a ranking based upon how well each strategy meets the entire range of policy objectives. Table ES-11 shows the ranking of the five strategies recommended by the regional providers.

Table ES-11
RANKING OF LEVEL 1 RESOURCE STRATEGIES

			Emphasized Policy Objectives				
Water Provider Ranking	**Strategy Number**	**Resource Additions**	**Natural Environment**	**Water Use Efficiency**	**Raw Water Quality**	**Costs**	**Catastrophic Events**
1	1.5	Outdoor Conservation, ASR, Clackamas, Willamette	✓	✓		✓	✓
2	1.3	Outdoor Conservation, Clackamas, Columbia		✓	✓	✓	
3	1.4	Outdoor Conservation, ASR, Willamette, Columbia		✓			✓
4	1.2	Outdoor Conservation, Bull Run Dam 3		✓	✓		
5	1.1	Maximum Conservation, Willamette	✓	✓			

Thus, based on the RWSP analysis conducted to date, water provider participants recommend Strategy 1.5 for consideration during preliminary RWSP review because it seems to best meet the broadest array of policy objectives identified through the planning process. This strategy focuses on the following major future resource additions:

- Outdoor water conservation;
- Aquifer Storage and Recovery;
- The Clackamas River; and
- The Willamette River

The advantages of Strategy 1.5 include:

- Relatively low costs;
- Relatively low environmental impacts;
- An emphasis on the efficient use of water;
- Relatively low vulnerability to catastrophic events; and
- Flexibility to deal with future uncertainty.

The overall raw water quality rating for Strategy 1.5 is comparable to Strategies 1.1 and 1.4. It is not as good as Strategies 1.2 or 1.3. The RWSP's raw water quality analysis has revealed that the quality of all the surface supply options is high when compared to most other municipal sources nationwide. The conservative treatment approaches recommended for the river sources will provide multiple-barrier protection against current and future contaminants and will yield good-tasting water. Moreover, the Willamette and ASR will both be used primarily as peaking sources. For the vast majority of any year, the region will be served by the Bull Run, the Trask/Tualatin system, and existing local supplies (primarily groundwater). In addition, the likely injection source for ASR will be the Bull Run.

The region's water providers are committed to an open and fair discussion about the merits of the alternative water futures available to the region. The public's response concerning the resource strategies presented and how these meet the region's needs is important. The providers fully recognize that no one "right answer" exists that perfectly meets all of the public's values. This is why several strategies are presented for consideration. Strategies 1.1 through 1.4 are also fully capable of meeting the region's water supply needs. They address some of the same policy objectives and, in many cases, do a better job at meeting particular objectives than Strategy 1.5. Nevertheless, none of the other alternatives seems to meet so many important objectives.

WHERE DOES THE REGION GO FROM HERE?

Regardless of the strategy adopted by the regional providers, a range of issues must be addressed in the near term. Providers have already expressed their commitment to establishing an ongoing regional organization to meet the region's water supply needs following RWSP completion. The exact form and functions of this organization will be discussed over the next few months prior to adopting the final RWSP. However, a key overall role will be to ensure that the needs of all water customers throughout the region are met within the context set by the adopted Regional Water Supply Plan. It will also consider possible long-term changes to the current institutional and financial arrangements under which water service is delivered in the region.

Not only must the ongoing relationships among the providers be defined, but so also must the critical role of Metro. Metro has the authority and responsibility to adopt and enforce the region's urban growth management strategy, including the adoption and revision of the Urban Growth Boundary (UGB). Thus, there is a direct relationship between Metro's role and the job of the regional providers to serve the water needs of the growing metropolitan region.

In addition, the Metro Charter requires Metro to adopt an Urban Water Supply and Storage Element in its Regional Framework Plan. As a RWSP participant, Metro itself will provide input on the preliminary and final RWSP documents. It will adopt the final RWSP by resolution. The relationship between the region's water providers and Metro requires further discussion as the region moves toward final adoption of a RWSP.

Specific near-term actions that must be undertaken by the region include:

- Adoption of a long-term regional resource strategy.
- Continued maintenance, upgrades, and remediation of the Columbia Southshore Wellfield.
- Expeditious completion of the Barney Reservoir and Joint Water Commission treatment plant and transmission expansions.
- Timely development of the additional committed capacity on the Clackamas River.
- Development of transmission and interconnection facilities to serve the short-term and medium-term needs of individual providers. It is critical

that these facilities be developed within the context of the adopted long-term regional strategy.

- Planning and implementation of an appropriate mix of conservation programs.

- Expanded coordination with the region's wastewater management agencies regarding the potential use of stormwater and treated effluent as non-potable water resources.

- Actions necessary to maintain the viability of all source options considered in the RWSP.

This last point deserves particular attention. Over the last two decades, events have shown that competing demands, coupled with increased regulatory requirements, will make securing water sources more difficult for the future. Contingencies must be considered if particular choices later become unavailable. The water providers should continue to protect their ability to utilize the water sources considered in the RWSP. This will require a variety of activities for each source option.

In short, completion of the RWSP project signals the region's water providers to continue and redouble the collaborative and visionary efforts that they have begun. Among the benefits of the RWSP effort has been an increase in trust and understanding among the providers that has allowed a truly regional plan to be developed. It is critical that the providers capitalize on this trust and understanding to immediately begin to undertake the near-term actions that will lead to effective plan implementation and will meet the needs of the region's water customers.

Public Workshops Set—You're Invited!

We need to hear from you!

You are invited to attend upcoming public workshops in your community. Please come to find out more about the Regional Water Supply Plan and tell us your views.

Open House starts at 6:00 p.m. The Workshop will be held from 7:00-9:00 p.m.

September 26—Washington County

Tualatin Valley Water District
1850 SW 170th Avenue
Beaverton

September 27—Multnomah County

Oregon Convention Center, Rooms 107/108
777 NE Martin Luther King, Jr. Blvd.
Portland

September 28—Clackamas County

OIT/North Clackamas Chamber of Commerce
7726 SE Harmony Road
Milwaukie

Questions? Need more information?
Call the Regional Water Supply Plan Office:
823-7528

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The Region's Water Providers participating in the Regional Water Supply Plan are:

Clackamas County
Clackamas Water Dist.
Clairmont Water Dist.
Damascus Water Dist.
Mt. Scott Water Dist.
Oak Lodge Water Dist.
Canby Utility Board
City of Gladstone
City of Lake Oswego
City of Milwaukie
City of Sandy
City of Wilsonville
South Fork Water Board

Multnomah County
City of Fairview
City of Gresham
City of Troutdale
City of Wood Village
City of Portland
Rockwood Water PUD

Washington County
City of Beaverton
City of Forest Grove
City of Hillsboro
City of Sherwood
City of Tigard
City of Tualatin
Raleigh Hills Water Dist.
Tualatin Valley Water Dist.
West Slope Water Dist.

Metro

Fall, 1995

REGIONAL WATER NEWS

Water for tomorrow, and the day after: Preview of regional plan

How will we meet our future water needs? After more than four years, the Portland metropolitan region's 27 major water providers and Metro have completed a preliminary Regional Water Supply Plan that outlines information and choices on how to meet future needs. Citizens and groups across the region have participated in the planning. We have learned a lot about what people care about, along with the range of possible options.

Now we and your elected officials need to hear your views on the choices and recommendations presented in the preliminary plan. Later this year, we will take the suggestions offered and prepare a final version for adoption by local decision makers.

Here are some highlights from the preliminary plan:

- **The region is fortunate to have abundant water.**
  With our current sources of water supply, and several planned enhancements already committed, major new sources of water should not be needed for more than 20 years — but steps must be taken now to complete these enhancements and protect the viability of future options. Occasional local shortages can be averted with new transmission lines and interconnections.
- **With conservation, today's water supplies will last even longer.**
  Citizens support conservation as the first step in meeting future needs. If we begin more aggressive conservation today, the region may not need new water sources for an additional decade—well into the 2020's.
- **Water quality can be assured in the future.**
  Citizens want high quality water, now and in the future. Each source of water considered in the preliminary plan when treated would meet or surpass current and known future drinking water and health standards.
- **A diverse set of goals and objectives must be addressed.**
  The reliability of the region's water systems — providing water when and where it is needed — is a key goal. Other goals and public values are important, too: promoting stewardship through efficient water use, keeping costs low, protecting the environment, and diversifying sources to avoid shortages caused by catastrophic events such as earthquakes, fires or spills.
- **Balancing these goals has led to a preliminary recommendation.**
  Analysis shows there are several ways to meet future water needs, but that each choice meets our objectives to a different extent. Recognizing there is no "right" answer and there are trade-offs associated with any choice, the region's water providers recommend a balanced plan that involves multiple resources, and a phased, long-term strategy for meeting future demand for water. The recommended approach provides a flexible guideline which can be used by the region's decision makers to handle new issues and changing circumstances over the next 50 years.
- **Effective regional coordination needs to continue.**
  The unprecedented partnership among the region's water providers and Metro must continue if we are to implement the best, most efficient water plan for the region.

We hope you will take a few moments to read more about the RWSP and to give us your feedback. To find out more, attend a workshop in your community on September 26, 27, or 28. **We appreciate your contributions.**

Tim Erwert
City of Hillsboro
Chair, RWSP Steering Committee

Mike Rosenberger
City of Portland
Chair, RWSP Participants Committee

How Much Water Do We Need?

Our population is expected to grow, and the region will eventually need more water. Current regional peak-day demand for water is up to about 370 million gallons per day (which we would experience if the most severe historical weather conditions — September, 1942 — occurred today). That's still well within current water capacity—about 413 mgd, with all current sources and transmission lines. With the additional, committed near-term water system expansion the region will have 493 mgd available by about 2004.

But the region will face higher demand in the future. The table right shows how much we will need by 2050, to meet high, medium or low population growth forecasts.

Peak Day Water Demand Forecast (MGD)*

	1992	2050: High	2050: Medium	2050: Low
Region	365	780	667	535
Multnomah County	183	305	269	227
Clackamas County	87	221	185	144
Washington County	96	255	213	164

**Assumes water savings from current conservation programs and existing standards for efficient plumbing fixtures and appliances.*

Where Will We Get The Water?

Conservation

Citizens strongly support conservation as the foundation for any strategy to meet the region's future water needs—to stretch current water supplies, to postpone costly development of new supplies, and to preserve our rivers and streams:

- Conservation already reduces indoor water demand through water-efficient plumbing fixtures and appliances and other efforts.
- Outdoor conservation offers savings at the time when water is needed most—summer. Further conservation measures can begin immediately.
- All alternative strategies to meet the region's future water needs include a strong conservation component.
- By year 2050, the recommended new outdoor conservation programs would save about 94 mgd. When combined with indoor water savings produced by water efficiency regulations and market forces, the total savings would be 174 mgd—becoming the region's second largest water "source."

New Water Sources

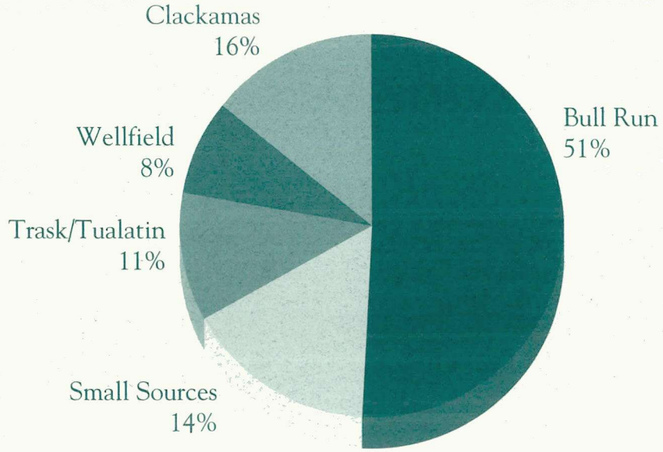
We are lucky to have many new sources of high quality water from which to choose. A number of possible regional water sources and transmission systems have been investigated.

- A third dam and reservoir on the Bull Run River
- Additional water from the Clackamas River
- New diversions from the Columbia River
- New diversions from the Willamette River
- Aquifer Storage and Recovery (ASR)
- New transmission lines to provide water where it is needed to meet growing demand

Sources: Today and Tomorrow

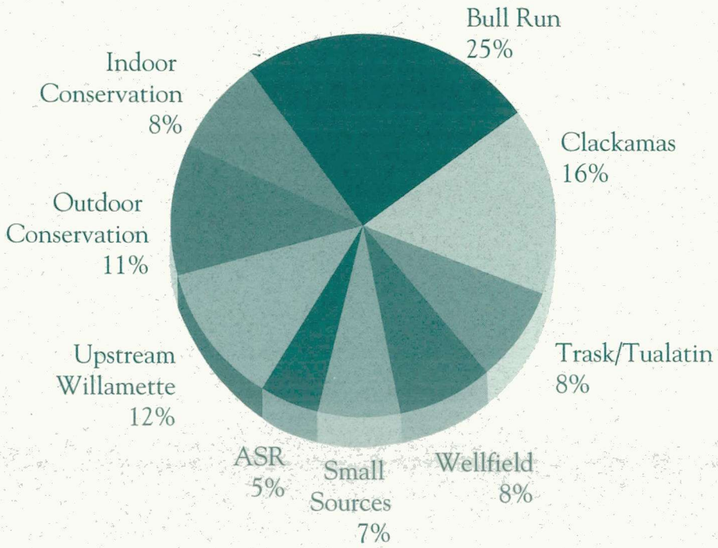
The charts show where the region's water comes from today and where it could come from under typical weather conditions in the year 2050 with the recommended strategy (which includes conservation and new sources of water).

Where Do We Get Our Water Today?



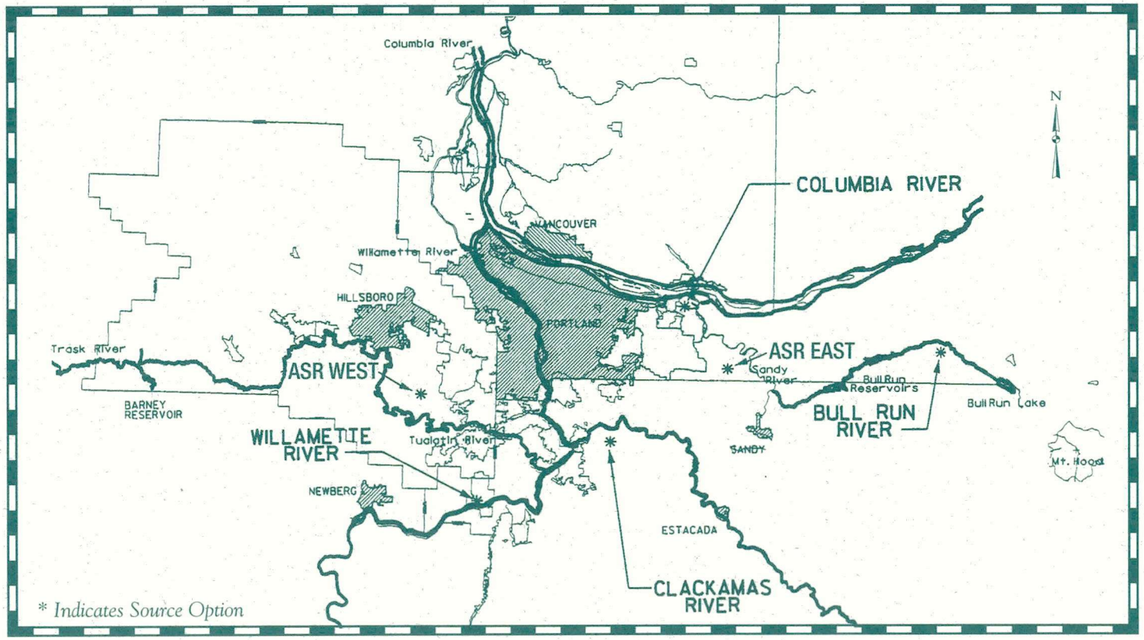
Note: Percentages reflect water system capacities. Chart does not depict current conservation practices and programs.

Recommended Strategy: The Region's Water Resources In 2050



Note: Percentages reflect peak day capacities. Actual use of these sources will vary in a given year because some are used primarily during the Summer months. "Indoor conservation" includes existing conservation programs and water savings from current efficiency standards for plumbing fixtures and appliances.

Regional Water Supply Sources



Regional Water Supply Plan
1120 SW 5th, Room 600
Portland, OR 97204-1926

What We've Heard From Citizens

Public information and involvement has been a cornerstone of this planning effort—and we've heard a lot. We hope to hear a great deal more.

Some of the methods used to reach out to citizens and interested groups:

- Workshops, public forums and roundtable discussions held in Clackamas, Multnomah and Washington Counties
- Public opinion surveys
- Interviews with community leaders and others
- Survey to assess how customers value water supply reliability
- Focus group discussions with citizens from across the region
- Over 100 presentations to interested organizations, neighborhoods, agencies and citizens
- Newsletters, customer bill inserts, and other informational materials
- Media coverage and advertisements
- Slide show and 15-minute video on the Regional Water Supply Plan

We have used what we've learned in many critical ways — crafting goals to guide the planning effort, and designing and evaluating alternative water strategies. Our aim is to identify options that satisfy a number of important public values.

Here's what citizens have told us:

Look first to conservation, use today's water efficiently

"Conservation has the highest return with lowest capital expense."
Scott B.

"With aggressive conservation, education and pricing efforts we can cut our per capita water use."
David B.

Respect the environment

"I want to preserve the quality of our rivers, streams and habitat. To the extent the need for drinking water conflicts, I'm willing to use alternative sources."
Mary F.

"We can adjust our standards to live with less water, but the same standards may not always be good enough for fish."
Marcia A.

Strive for high water quality — at the source and the tap

"The quality of the water we get is the most important thing. Our health depends on it."
Sam A.

"I'd pay triple what I pay now to get high quality water."
Frank R.

Be mindful of costs — but don't cut corners

"Make sure there's a real reason to raise our rates — and explain it to us."
Focus Group Participant

"We worry too much about costs. Water quality is expensive, but we have to maintain high health standards - and we all have to pay for it."
Elizabeth H.

Build public confidence

"Just make sure those who work for the agencies drink the water, too, and I'm sure it will be of adequate quality."
Roy W.

"Never have I seen an area working so diligently and intelligently on its water programs, or so hard to solicit opinions of the public."
Chuck H.

How Do Alternative Strategies Measure Up?

We used what we learned about public values to select policy goals for the Regional Water Supply Plan. With these goals in mind, we then created alternative water resource strategies to meet future needs. Strategies were designed to satisfy different combinations of public values. Comparison of these alternatives underscores the fact that all of us in the region must discuss tradeoffs between often conflicting values. There are no "perfect" answers.

Fashioned from different combinations of conservation measures and water supply sources, long-term strategies were evaluated on the basis of how well they meet the full range of public values. The example below shows how five alternative strategies perform in satisfying key policy values.

Categories of Policy Values

- Efficient water use
- Water supply reliability
- Water quality
- Minimize impacts of catastrophic events
- Costs
- Environmental impacts
- Flexibility
- Ease of implementation

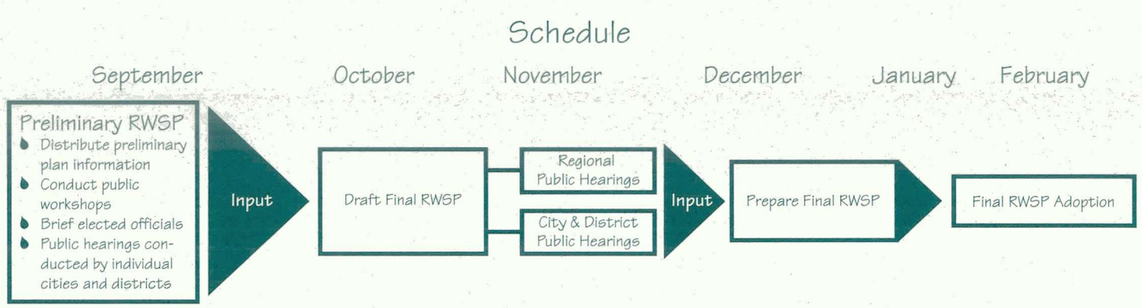
Many Strategies We'veEvaluated Using RWSP Goals

Strategy Number	Resource Additions	Natural Environment	Water Use Efficiency	Raw Water Quality	Costs	Catastrophic events
1.1	Maximum Cons, Willamette	X	X			
1.2	Outdoor Cons, Bull Run Dam 3		X	X		
1.3	Outdoor Cons, Clackamas, Columbia		X	X	X	
1.4	Outdoor Cons, ASR, Willamette, Columbia		X		X	
1.5	Outdoor Cons, ASR, Clackamas, Wilamette	X	X		X	X

Next Steps

The preliminary Regional Water Supply Plan is just that—preliminary. Over the coming months citizens, businesses, other interested groups and elected officials around the region will be asked to comment on the plan before any decisions are made.

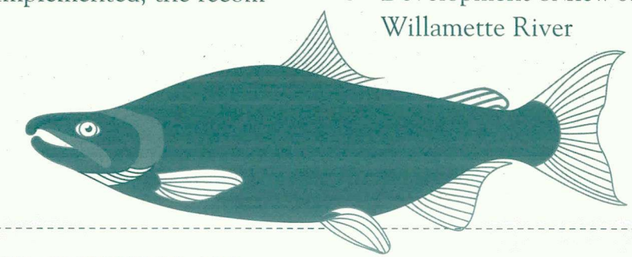
The region's water providers will prepare a final plan by late 1995, taking into consideration citizens' views and additional information. The plan will be submitted to local elected officials for adoption during early 1996.



Regional Water Supply Plan Recommended Strategy

After evaluating the various alternatives, the region's water providers are recommending a long-term strategy that balances diverse resources and meets more policy objectives than the others. The recommended strategy minimizes environmental impacts, ensures high quality water, enhances the system's flexibility, keeps costs down, promotes water efficiency, and provides reliable quantities of water to meet anticipated future needs. If fully implemented, the recommended phased-in approach would add to existing resources by the year 2050:

- Aggressive region-wide conservation
- New water transmission lines to provide efficient, reliable primary and backup service
- Aquifer storage and recovery systems in the east and west sides of the region
- Additional water from the Clackamas River
- Development of new supplies upstream on the Willamette River



Please cut here and return

REGIONAL WATER SUPPLY PLAN
WE APPRECIATE YOUR COMMENTS AND SUGGESTIONS!

Name (optional) _____ Phone: _____

Address: _____

☐ I support the preliminary plan effort. Please keep me informed.

☐ My suggestions to improve the plan: _____

_____

_____

_____

_____

☐ Other comments/questions

_____

_____

_____

_____

Please send me more information:

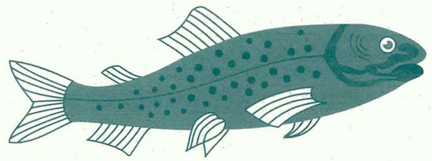
☐ Executive Summary (38 pages)

☐ Preliminary Plan (356 pages) [Copies also available in area libraries]

☐ Article on the plan for my organization's newsletter

☐ Video (copies available for check out)

☐ Call me to arrange a briefing for my organization/neighborhood



REGIONAL WATER SUPPLY PLAN

Portland Metropolitan Area

September 6, 1995

PARTICIPATING WATER PROVIDERS

City of Beaverton
Canby Utilities Board
Clackamas Water District
City of Gladstone
Clairmont Water District
Damascus Water District
City of Fairview
City of Gresham
City of Hillsboro, Utilities Commission
City of Forest Grove
City of Lake Oswego
City of Milwaukie
Mt. Scott Water District
Oak Lodge Water District
City of Portland
Raleigh Water District
Rockwood Water
City of Sandy
City of Sherwood
South Fork Water Board,
(City of Oregon City
City of West Linn)
Tigard Water Dist.
City of Troutdale
City of Tualatin
Tualatin Valley Water District
West Slope Water District
City of Wilsonville
City of Wood Village
Metro

Interested citizens, organizations, and agencies:

The enclosed Preliminary Regional Water Supply Plan represents more than four years of cooperative partnership among twenty-seven municipal water providers and Metro. It contains technical information, findings, alternatives and recommended strategies for meeting future water demands in the tri-county Portland metropolitan region.

The region's water providers are now circulating the plan for review and comment on the choices and recommendations contained in the report. Throughout the planning process, we have sought and used input from local residents, organizations, businesses, and decision makers to ensure that important public values and concerns are addressed. Your comments will be considered carefully as the Preliminary Plan is revised in late 1995.

We have learned that our existing water resources can be managed to meet regional needs for the next couple of decades. The completion of planned system enhancements and continued conservation efforts can stretch existing supplies. A more aggressive commitment to conservation can delay further the need for new supply increments. In addition, several of the region's water sources appear viable to meet long-term needs. The plan provides a list of actions to maintain and enhance the quality and quantity of today's water sources to benefit current and future generations.

The plan also sets forth several strategies for meeting demand to the year 2050. The strategies are evaluated against key public concerns including water quality, system reliability, cost, environmental protection and conservation. The choices contained in the plan meet different objectives to different extents. There is no "right answer." The recommended strategy reflects an attempt to meet multiple objectives and provide sufficient flexibility to accommodate changing circumstances over the next fifty years. The region must now give careful consideration to the tradeoffs associated with the choices.

We invite you to review these preliminary reports and share your views at upcoming public workshops (see enclosed flyer) or in writing. More workshops and public hearings will be held over the next several months. Our goal is to submit a proposed final plan to local decision makers for adoption in early 1996.

(over)

Regional Water Supply Plan Project, 1120 S.W. 5th #601, Portland, Oregon 97204-1926 (503) 823-7528

Please call your local water provider or project management staff for more information or to arrange a briefing on the Regional Water Supply Plan (see attachment for contacts).

Sincerely,

Tim Erwert

Tim Erwert

City of Hillsboro, Joint Water Commission
and Chair, Steering Committee
Regional Water Supply Plan

Michael Rosenberger

Michael Rosenberger

Portland Water Bureau, and
Chair, Participants Committee
Regional Water Supply Plan

Attachments

REGIONAL WATER SUPPLY PLAN -- PHASE 2
PARTICIPANTS COMMITTEE

Clackamas County Area

CANBY UTILITY BOARD
Bob Rapp, 266-1156

CITY OF GLADSTONE
Ron Partch, 656-5223

CITY OF LAKE OSWEGO
Duane Cline, 635-0280

CITY OF MILWAUKIE
Dan Bartlett, 659-5171

SOUTH FORK WATER BOARD
Larry Sparling, 657-5030

CITY OF SANDY
Mike Walker, 668-5533

CITY OF WILSONVILLE
Jeff Bauman, 682-9772

CLACKAMAS RIVER WATER *
Dale Jutila, 656-5752
Alan Fletcher, 656-7240

DAMASCUS WATER DISTRICT
Dennis Klingbile, 658-5585

MT. SCOTT WATER DISTRICT
John Thomas, 761-0220

OAK LODGE WATER DISTRICT
Thomas Hoffman, 654-7765

Multnomah County Area

CITY OF FAIRVIEW
Jeff Sarvis, 665-9320

CITY OF GRESHAM
Greg DiLoreto, 669-2402

CITY OF TROUTDALE
Jim Galloway, 665-5175

CITY OF WOOD VILLAGE
Sheila Ritz, 667-6211

Multnomah County Area - Cont.

PORTLAND WATER BUREAU
Mike Rosenberger, 823-7555

ROCKWOOD WATER
Duane Robinson, 665-4179

Washington County Area

CITY OF BEAVERTON
David Winship, 526-2434

CITY OF FOREST GROVE
Rob Foster, 359-3225

CITY OF HILLSBORO
Tim Erwert, 681-6119

CITY OF SHERWOOD
Ron Hudson, 625-5522

CITY OF TUALATIN
Mike McKillip, 692-2000

RALEIGH HILLS WATER DISTRICT
Von Walter, 292-4894

CITY OF TIGARD WATER DEPARTMENT
Ed Wegner, 639-4171

TUALATIN VALLEY WATER DISTRICT
Gene Seibel, 642-1511

WEST SLOPE WATER DISTRICT
Roger Meyer, 292-2777

Regional

METRO
John Fregonese, 797-1763

Project Management Staff

Lorna Stickel, Project Manager - 823-7502
Roberta Jortner, Senior Planner - 823-7493
Dominique Bessée, Admin. Assistant - 823-7528

* Formerly Clackamas Water District and Clairmont Water District

❖ How should future water needs be met in the ❖
Portland tri-county metropolitan area?

Learn about the choices - Express your views

REGIONAL WATER SUPPLY PLAN
PUBLIC WORKSHOPS

❖

Tuesday, September 26, 1995
Tualatin Valley Water District
1850 SW 170th Ave., Beaverton

❖

Wednesday, September 27, 1995
Oregon Convention Center, Rooms 107 and 108
777 NE Martin Luther King Jr. Blvd., Portland

❖

Thursday, September 28, 1995
OIT/North Clackamas Chamber of Commerce
7726 SE Harmony Road, Milwaukie

❖

Open House at 6 p.m. - Workshops from 7 to 9 p.m.

❖ *Refreshments provided* ❖

sponsored by the region's municipal water providers and Metro

CITY OF
PORTLAND, OREGON
WATER QUALITY ADVISORY COMMITTEE

Mike Lindberg, Commissioner
Kathleen A. Concannon, Chair
1120 S.W. 5th Avenue
Portland, Oregon 97204-1926
Information: (503) 823-7404
FAX: (503) 823-6133
TDD: (503) 823-6868

Date: October 13, 1995

To: Commissioner Mike Lindberg

From: Kathleen Concannon, Chair KC
Water Quality Advisory Committee

Subject: Regional Water Supply Plan Preliminary Report

The Water Quality Advisory Committee (WQAC) appreciates the time and effort Water Bureau staff have expended providing information to our committee during Phase I and Phase II of the Plan. Many of our recommendations made on Phase I (see August 24, 1992 WQAC letter to Lindberg) were incorporated into Phase II.

WQAC has reviewed the Regional Water Supply Plan Preliminary Report. We have the following recommendations that reflect our core beliefs about the future supply of water:

1. Consistent with past actions of the WQAC, and consistent with the public input in our meetings and in the planning process, we have decided *unanimously* that superior raw water quality is our most important value and all our recommendations stem from that. In this regard, we believe that developing the raw water resources of the Bull Run Watershed is preferable to developing the raw water of the Columbia and Willamette rivers and other low quality alternatives. (See August 24, 1995, WQAC letter to Lindberg, recommendation No. 5). We believe that other listed values are secondary, with environmental and reliability values following equally in importance. Cost is not rated high on our list of values, except in terms of equity for current users. We acknowledge tradeoffs having raw water quality as our highest value.

2. Thus far in the regional planning process, all values are weighted equally. We recommend that raw water quality be given more weight than other values in the final plan and in your decision-making.

3. Also consistent with our past position, and considering the true effects of growth in the region, we wish to emphasize our continuing *unanimous* determination that conservation be an integral part of any adopted Regional Water Supply Plan.

4. With the above principles in mind, we recommend that an additional strategy be developed that contains the following elements:

   - Pursue maximum use of the Bull Run Watershed including a thorough study of a third reservoir, filtration and the possibility of greater use of Bull Run Lake.
   - Pursue state-of-the-art conservation for regional residents and industry.
   - Pursue Aquifer Storage and Recovery and aquifer protection to ensure aquifers are protected for future use.
   - Eliminate the Columbia River from further study as a potential source.
   - Continue to explore additional sources such as the Little Sandy River.

- We do not recommend the Willamette River as a source. We realize that other providers might use the Willamette River and we support the City's efforts to clean the river and help other providers protect the Willamette River's watershed.
- Work with other providers to protect the watersheds for their present and future sources such as the Clackamas, Trask, and Tualation and the Tillamook State Forest.

In our deliberations about these recommendations, we have identified many issues and concerns about the information developed for the Plan. The WQAC requests an opportunity to discuss the effects of regionalism on the water supply and equity for all current users, and impacts to the control of the water supply, specifically the Bull Run. Also, we believe that more discussion is necessary regarding the effects of a potential regional decision-making process and how decision makers would represent the public.

Serious concerns about other issues were also voiced by committee members. We want to pursue these concerns further with the Water Bureau, but we believe they should also be considered in your decision-making process. Our concerns are listed in an attachment to this letter.

We appreciate the opportunity to review the Regional Water Supply Plan and to make recommendations. We ask that you consider them fully. We would be happy to meet with you to discuss any questions you may have.

Attachment

cc: Mike Rosenberger
Rosemary Menard
Lorna Stickel

Other Concerns Voiced by the Water Quality Advisory Committee on the Regional Water Supply Preliminary Plan

Ranking of Sources - We are concerned that recommendations do not meet public values, and are concerned about how sources were ranked for environmental impacts, catastrophic events, etc.

Regionalism - If decisions about water supply are made regionally, then decisions about new industry and others should be made regionally also. What are the financial impacts if other providers do not endorse all aspects of the plan?

Costs - What is the policy for allocating costs of additions to a regional water supply? Will pricing be used to encourage conservation?

Growth - What are the consequences of the overall message of the plan, that is, that there is enough water for growth in the region.

Equity - Will city residents' water quality be lower than that of new suburban residents? Will drinking water be sacrificed to support industrial growth in the suburbs? Who benefits and who pays?

Enforcement - How would agreements about conservation, etc. be enforced? Are other providers accountable?

Dual Systems - What are the opportunities for dual water systems?

Decision-making and Administration - We acknowledge that the plan states more discussion is necessary about how decisions will be made and how the plan will be carried out. We agree and want to be included in these discussions since there is not enough information to make recommendations now.

CITY OF
PORTLAND, OREGON
OFFICE OF PUBLIC UTILITIES

Mike Lindberg, Commissioner
1220 S.W. Fifth Avenue
Portland, Oregon 97204
(503) 823-4145
FAX: (503) 823-3017

MEMORANDUM

To: Mayor Katz and Members of the City Council
Portland Water Quality Advisory Committee
Multnomah, Washington and Clackamas County Commissioners
Other Interested Parties

From: Commissioner Mike Lindberg MDL

Date: October 17, 1995

Re: Attached Report on Water Demand of the High-Technology Industrial Sector

In response to strong ongoing interest in water consumption by the Metropolitan Area's burgeoning high-technology industry, the Portland Bureau of Water Works has developed the attached report for your consideration. As with any attempt to project consumption trends into the future, there are unknown variables that limit the certainty with which these conclusions can be presented. At the same time, I hope that readers will agree that the report's key assumptions have been framed carefully and with the intent that any error should fall in the direction of overestimating rather than underestimating future water demand.

It is possible to interpret this report as good news, in the sense that the worst-case (i.e., highest possible consumption) scenario is better than some have thought, and could be readily managed. While that might be true, I hope that no one finishes reading this report with a sense of complacency. All of the consumption figures in this report represent large quantities of water, a precious resource that will be subject to continuously more intense demand for the foreseeable future. Any hesitation to look for demand-reduction opportunities in this sector would be inconsistent with our planning responsibilities.

Some of those opportunities are being pursued today. The Water Bureau's dedicated work with several large industrial customers has resulted in several cases of dramatic demand reduction. And the increasing cost of water in a rigorously competitive market environment has moved a number of companies towards efficiency improvements on their own initiative.

These vital advances in industrial conservation must continue. As part of the City Council's pending discussion of the Regional Water Supply Plan, I will be proposing the vigorous development of policy options that will strongly encourage more industrial conservation and water-recycling initiatives, as well as extensive exploration of options to reduce the reliance of our largest industrial customers on Bull Run water by offering alternative sources.

Consistent with my past public testimony, I also intend to insist that state-of-the-art water conservation and recycling performance be included among the conditions of any future tax abatement offered to businesses that require high-volume water supply. Awarding tax abatements to firms that are not committed to the highest achievable levels of water-use efficiency would be exceptionally short-sighted.

I would be very interested in hearing policy suggestions and observations in connection with this report. Please direct any technical questions to Lorna Stickel at the Portland Water Bureau (823-7502).

The high tech electronics industries and water demands in the Portland Metropolitan area.

by
Lorna Stickel, Portland Water Bureau
October 1995

In recent months there has been considerable concern expressed over the number of high technology electronics firms that have either decided to locate in the Portland metropolitan area or have been exploring the option of locating here. Three recent Strategic Initiative Program applications for property taxation relief due to the disproportionately high values associated with the buildings and industrial process developments have brought to the fore concerns about the number of these firms which will ultimately locate here. High on the list of concerns is the amount of water which these companies will consume. Past history with the few chip or wafer fabrication firms that have already located here (Intel, Wacker, and Fujitsu), and with these same types of firms in other locations, shows that they are indeed high water consumption customers. In many cases they are the single largest customer within the water entity responsible for their service.

This brief paper will examine what is known about these firms in the Portland area and the impacts they have on overall water consumption patterns. A caveat is needed however. Only limited information is available on high tech consumption patterns within this region. Even less is known about the prospects for future consumption patterns. Much information is proprietary to these private firms, the technology is constantly changing, and the water usage within established facilities can change as the processes themselves are changed.

The ability of forecast industrial sector growth is very limited so that it is not possible to say with any degree of certainty what the long term nature of this or any other specific industrial sector will be over time frames longer than 10-15 years. For this reason, the information presented here is the best available and is limited to a fifteen year time frame. In addition, future additions to the urban growth boundary cannot be predicted at this time and therefore lands beyond those already urbanized are not included with the estimates of consumption.

A. Existing and potential high tech facilities for the region

The nature of high tech water use

High tech water plants are large water consumers within the context of industrial users in the Portland metropolitan area. There are some very high water using industries in the northwest overall, such as pulp and paper plants, steel mills, and ship facilities. Often these users (including some in the Portland harbor) use larger amounts of water directly from surface or groundwater sources without potable water treatment processes. In the Portland retail area (roughly the City limits) the highest industrial water users currently include facilities such as brewers, chemical manufacturers, food processors, and a high tech plant. The next highest water users are hospitals, school and parks districts, and the Port of Portland (which encompasses a number of individual smaller users). Currently the 10 largest water customer accounts within the City of Portland use between .3 to 1 MGD.

The next largest water supplier is the Tualatin Valley Water District (Portland's largest wholesale customer) serving the Washington County area. Their top ten customers currently also fit within this range of consumption. So any single customer over 1 MGD would be a large customer by the standards of the Portland region. Within the City of Portland the top ten customers account for approximately 20% of the average water use of the industrial/commercial accounts and about 5% of the total average water use. In the City of Portland the overall split of total water consumption in the 1994/95 period was 56% residential and 44% non-residential. This type of a split would generally not be reflected in other water supplier entities since Portland has a higher proportion of industrial/commercial land use than other more suburban areas. In other jurisdictions outside the City of Portland the percentage of residential use (single family and multifamily) will be somewhat higher.

High tech plants are large water users in general. For the smaller districts and cities to whom the city of Portland sells Bull Run water wholesale and for the Joint Water Commission (Beaverton, Hillsboro, Forest Grove and now the Tualatin Valley Water District), the single highest users are high tech plants and other electronics industries (such as Tektronix). Following are food processors, hospitals, and institutional users (such as parks programs). High tech plants have the potential to become the single largest industrial sector of water consumption for those entities which serve those users.

The nature of water use in these plants varies depending on the type of manufacturing process. Research and development facilities use less water, followed by wafer manufacture, and then by the actual production of chips which are the largest water using facilities. The processes inside these plants include water use for domestic purposes (human consumption and uses typical of any industrial plant), boilers (heating), washing of chips or wafers during fabrication which is usually pre-treated at the plant to assure consistent ultra-high quality water (pre-treatment through reverse osmosis and distillation), scrubbers for air emission treatment (often using the recycled water from the wafer or chip manufacturing process), and for cooling towers (for air conditioning which also can use recycled water). The amounts of water required depend on the size and number of fabrication or chip manufacture buildings (often called fabs). The largest segment of direct water use in these facilities is for chip and wafer washing during the manufacturing process[1].

In addition, the large campus settings for these plants means that average monthly usage increases during the summer months when outdoor watering occurs For the plants currently in operation the increase associated with irrigation appears to be in the 10-20% range. At this time, water used for outdoor watering is potable, however, both existing and future facilities are exploring the potential to utilize non-potable water for their facilities. For water that has not evaporated during the manufacturing process, a pre-treatment facility is used to ensure that the outflow from these plants can meet standards established for each facility by the wastewater receiving entity. Water provider engineers have been working with the existing, expanding and potential plant management staff to discuss ways to recycle water inside the manufacturing plants so that the quantity of both the inflows and outflows can be moderated. The charges for just the water supplies of the magnitudes

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[1]*Some of the information about internal manufacturing processes are proprietary and therefore no specific plant processes are presented, but the above information is based on real data.*

being discussed are substantial (apart from system development charges for tanks, transmission lines, meters, and other system expansions which are collected up front before the facilities come on line). For example within the Gresham service area the anticipated revenues from a facility that uses 1-1.2 MGD[2] (based on the higher use figure during the months of Jun-Sept) are $530,000 per year and for a 3-3.6 mgd facility would be $1,579,000 per year[3]. There is also the added costs of wastewater disposal which are also very substantial. The incentives to conserve water are significant with these types of expenses for the production of chips or wafers. Existing companies have implemented and continue to develop water saving tools and processes.

Existing High Tech Firms, Water Use, and Water Providers:

1. Intel (Aloha facility)	1 mgd annual average (Tualatin Valley Water District supplier)
2. Fujitsu (Gresham facility)	.8-.9 mgd (Rockwood PUD supplier)
3. Wacker Siltrontic (Portland)	.81 mgd annual average (Portland Water Bureau supplier)
TOTAL	2.71 MGD (all currently Bull Run system supplied)

Potential Future High Tech High Water Demands (high consumption facilities only) for Both Existing and Future Facilities

The extent of future demands from this industrial sector is difficult to predict with any real certainty due to many factors which will be discussed in following sections of this report. Some firms are certain, in other cases they are sites which meet the requirements of this sector and which have been examined, studied, optioned, or purchased by a number of different firms which may or may not locate in this area. For this reason some of the potential locations are identified by geographic area only and are included as possible sites for high tech users. Representative water is estimated based on both past proposals and assumptions that future facilities will use like processes to those firms already located here. This all means that the predictions for the future are more appropriately identified as possible ranges of consumption rather than known amounts.

1. Intel - Expansion plans at Ronler Acres (2 fabrication plants by 2008) (.9 mgd/fab) increase at this site of 1.8 mgd total. Aloha Facility increase of .5 mgd when new construction completed at the existing plant site (2 fabrication plants and 1 development process technology plant) increase at this site of .5 mgd total.
Total increase at Intel 2.3 mgd. Water provider (source): Joint Water Commission (Trask & Tualatin water) at Ronler and TVWD (mostly Bull Run water) at Aloha facilities with a backup from Beaverton (part of the JWC). With existing and future expansion plans for next 10 years this is an overall total of

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[2] MGD means millions of gallons per day and the abbreviation will be used from this point forward.

[3] This is based on 1995 rates

3.3 MGD, There is room at the Ronler Acres site for potentially 2 more fabrication facilities, but no plans at this time to build these. (Contact Bill Calder at Intel 264-5669) Intel both fabricates wafers and makes microprocessor chips. Their water source is both JWC (Ronler Acres) and TVWD (Aloha site).

2. Fujitsu - Expansion at the Gresham site of another fabrication facility for an increase in .6 mgd for a total at this site in the next 10 years of **1.5 mgd.** There is room on this site for more facilities than those currently planned. (Contact Duane Robinson at Rockwood PUD at 665-4179). The recent SIP approval for the expansion requires efficient water use technology at the facility. This company makes computer memory chips. Their water source comes through Rockwood Water PUD and is the Bull Run.

3. Wacker Siltronic - This site in NE Portland has limited expansion areas for new facilities, but the plant is being expanded now and according to Wacker plant personnel their use could increase by 2.2 MGD for a total usage of 3 MGD. However, the firm has indicated that they anticipate dropping back to a total of 2 mgd over the next few years after construction at this facility as they install more efficient water processes. (Contact Jim Doane of the Portland Water Bureau at 823-7505). This is a silicon wafer fabrication facility. Its water source is City of Portland Water Bureau which is Bull Run.

4. IDT - This plant is under construction in Dawson Creek Industrial Park in Hillsboro and will be on-line in early 1996 at .5 MGD. This facility could pursue another expansion within 10 year period adding another .5 mgd for a total of 1 MGD. This company manufacturers chips. Their water source is Joint Water Commission (Trask/Tualatin water).

5. Komatsu - This is a silicon wafer fabrication facility which has announced plans to build at Dawson Creek Ind. Park in Hillsboro. The company has purchased an option on the property and appear committed at this point. Total water use is projected to be .5 MGD. Their water source would be from the Joint Water Commission (Trask/Tualatin water).

6. LSI - City of Gresham at the McGill nursery site between Stark and Burnside and NE 223rd and Highway 26. They have plans to construct 6 fabrication plants within the next 10-15 years. Each plant could use up to 1 MGD for a total water use of 6 MGD. They have talked about water recycling possibilities and the SIP approval for this facility requires water use efficiencies to be implemented. In line with the reduction of water consumption forecasted by Intel and Fujitsu, recycling could reduce water by 35-40% from original estimates of water demands. This plant in its first phase appears a certainty. Their water supplier would be the City of Gresham and the source is Bull Run. This company manufactures custom computer chips.

Total water demands for anticipated high tech chip/wafer fabrication could reach about 15.3 MGD over the next 10-15 years, (this number includes the 2.71 mgd of existing use). However, these estimates are speculative due to the following factors:

There is a considerable ability to recycle water within these plants. Some of the facilities in the above list are recycling or planning on doing it, while others are not including estimates of how they might reduce their overall water use. There have already been some discussion about the ability

of some other industries which could make use of the water from the high tech facilities in their processes if they were located in close enough proximity to the high tech plants. In addition, non-potable sources could meet some of the demands for summer time outdoor water use. In the Unified Sewerage Agency (USA) service area in Washington County summer treatment levels of IV provide very high quality treated effluent which could be used for outdoor uses and for some less demanding process water requirements.

These plants might not all expand, build to the extent anticipated, or continue the same level of production or processes over time. As the plants evolve from research and development to full-blown production, the water use increases. If the type of processes or products change then water use can increase or decrease over time. Competition from other parts of the country, global markets, monetary policy, and the economy could well affect these firms phasing programs and continued production activities.

Additional Sites in the Portland Metropolitan Region

It is not possible as a part of the research for this paper to conduct a comprehensive alternative site analysis for all available industrial properties which could be utilized by high tech firms. However, discussions with officials from the Portland Development Commission, City of Hillsboro, and some industrial firms indicate that the available inventory of industrial properties which meet the very strict set of locational criteria for high tech chip and wafer manufacture are very limited in the primary Portland (Oregon) metropolitan area. Apart from specific locational factors for these types of firms, economic factors that apply to a single market sector such as this indicate that there are some limitations for the region to absorb much greater numbers of firms.

The general factors which affect how many high tech firms might locate in this region include such things as market saturation, availability of available labor force with the right skill set, construction workers to build large facilities such as these when multiple projects are underway, ancillary firms that supply needed inputs to high tech manufacture, and technical training and research support facilities.

Site specific factors which affect how much suitable land is available include such things as:

- Size of the site - Generally the larger fabrication and manufacture facilities are looking for large sites with existing industrial zoning. The preferred size seems to be between 100-200 acres, however, some facilities are located on smaller sites in this region such as IDT on 20 acres and Komatsu on 50 acres. However, the larger firms represent the bulk of the water consumption. The reasons given for needing the large sites include the overall footprints of the plant buildings, the desire to phase in facilities over time and to have room for expansion, the need for large parking areas, and the desire to have large landscaped areas for both aesthetics and for buffers between the plant sites and adjacent uses.

- Site Stability - A stable site free from vibration is a very important factor for these facilities. This is a key reason why alluvial fill areas have generally not been found to be acceptable, as well as areas close to large transportation facilities such as freeways, major arterials, active rail lines, and large airport noise zones. This factor can also influence the

need to have a larger site that protects the facilities from conflicting uses located close enough to cause a problem with vibration. Another factor is the need to be free from electro-magnetic fields which precludes sites close to overhead power transmission lines.

- Proximity to appropriate infrastructure - Requirements include having adequate water quantity and transmission to the site, adequate wastewater capacities and transmission from the site, and access to appropriate intermodal transportation facilities such as international airports and major truck routes.

- Nearby feeder industries and support business - These large production facilities create an ancillary wave of support businesses that provide inputs and utilize the outputs of these firms. Sites which have access to these associated businesses are also desirable.

- Ownership sizes - Sites which are already assembled into larger ownerships and with the appropriate zoning are much more likely to be considered by these types of firms than those where plan and or zone changes are needed or when the land is in multiple ownerships.

(This information is supported by the Background Report for the Multnomah County SIP Program approval process 2/24/95, Multnomah County Commissioner Stein's office)

For the above reasons there appear to be limitations to both the overall number of high water consumption manufacturing high tech firms which could be absorbed by the region, and to the number of sites which meet the siting criteria listed. Additional sites do exist in Clark County, Washington (SEH America is already located here), however, this area is not connected to Oregon municipal water systems. A couple of additional sites in Oregon have been considered by these type of firms and they remain viable sites for high tech firms to develop. They include:

Seaport Industrial Site - This property is North of Sunset Highway in Washington County between West Union and Jackson Road. Samsung was most recently considering locating at this site, but recently announced they will not locate in Oregon. However, the site can accommodate a large development of high tech facilities. Officials of Hillsboro anticipate that chip manufacture at this site could use between 1 to 3 MGD. The site is currently in the TVWD service area. TVWD has recently joined as a participant of the Joint Water Commission and a large transmission line is in the design process for this site which would bring in Trask/Tualatin water which could be augmented by Bull Run water so the site will be served by two different water sources.

Toshiba America - This firm has owned property in the Washington County, Hillsboro area for a few years. There is no commitment at this time to build high tech facilities at this site nor are there known water usage figures. Based on site, size a reasonable figure if a high tech company were to locate there might be .5-1 mgd. The water provider for this site would be the Joint Water Commission (Trask/Tualatin water).

There are other locations that would seem to meet some of the above criteria, including smaller sites in the Columbia South shore area, Clackamas County along Highway 212, Wilsonville, and the Tualatin area. Yet all of them have one or more limitations that significantly reduce the potential for these areas

to attract wafer or chip manufacture facilities on the scale already identified. There may be some additional capacity on sites around the Washington County sites on Shute Road, Seaport, or Dawson Creek Industrial Parks but these also are limited. Additional lands being considered as a part of the Metro 2040 process for inclusion in the Urban Growth Boundary (UGB) may have some potential for industrial zoning in the future such as some land additions north of the Sunset Highway in Washington County, but the land inventory may well require that some existing industrial zoning would have to be removed in order for these lands to be zoned for industrial purposes. One other possibility might be lands in the Damascus-Boring area, but large ownerships are not common in this location and the transportation facilities would need significant improvement. For the purposes of this paper in the time period under consideration (to the year 2015) only the two sites listed above will be considered as viable for high tech use. This would add a range of from 1.5-4 mgd of additional water demand for high tech firms.

Together with the known sites this puts a final tally of potential high tech electronics firms water demands at 19.3 mgd by the year 2015. This number includes the 2.7 mgd of existing use. This is a high estimate and is conditional based on the actual construction phasing, locational decisions on the uncommitted sites, the actual high tech manufacturing processes, and the extent to which internal recycling processes and non-potable water systems could be developed. The actual amounts then could have a range from **11-22 mgd. The upper estimate leaves leeway for a couple of as yet unidentified sites for smaller high tech facilities. Of this total 2.71 MGD is already being used.**

B. Water Supply Implications of this market sector

Current system capacities and demands

Current regional installed peak day capacity of the region as a whole is 413 mgd. With additional supplies already programmed to come on line before 2005 (which include the return of Portland wellfield capacities to 72 MGD, the expansion of Barney Reservoir and JWC Treatment plant expansion of 20 MGD) These additional supplies are directly relevant to the current sources of supply for the areas of the plants identified above. The total installed peak day capacity of the region is expected to be 493 MGD by the year 2005. The two municipal water supply systems (those of Portland and the Joint Water Commission) which are to be tapped by the firms and sites listed above are the first and second largest individual water systems in the region. Some of the sites, such as the Seaport site and the Intel site at Aloha have close or adjacent connections to both of these above water systems. The Tualatin Valley Water District (TVWD) in Washington County is Portland's largest wholesale customer. TVWD has recently become a member of the JWC system and are in the process of building a large (72") pipe connection to bring JWC water into the west end of its service area. So, although the Seaport site will be served by the TVWD, the source water will be JWC supplies. The current peak day capacity of the two systems (Bull Run and Trask/Tualatin) together is 288 MGD with a usable storage capacity of 11.3 billion gallons. With the expansion of the Barney reservoir and the JWC treatment plant and the return of more of the capacity of the Portland wellfield the peak day capacity will be 345.5 MGD and a storage volume of 16.5 billion gallons.

Current estimated 1995 peak day usage for average weather years for the region as a whole is 375 mgd compared to a current installed peak day capacity of 413.8 MGD. Current estimated 1995 peak season demands for the region as a whole are 223 MGD and the winter or non-peak season are estimated as 149 MGD. The current installed capacity has been modeled to more than meet the current demands for peak day and throughout summer and winter seasons. The nature of water system usage in the Portland metropolitan area is such that daily winter use is usually half or less than that of the peak day needs, while over the four summer months (June-September) the average use is about 60% to two thirds that of a peak day demand. The nature of this "peaking" use pattern requires that the region's installed water systems (including pipelines, storage, tanks, treatment plants, and pumps) have more than adequate capacities to serve up to peak day demands. Peak season average usage is also not a significant limitation except for those systems that have seasonal storage or volumetric limitations. Peak day or peak events (1-5 consecutive days that exceed 95 degree temperatures) are what stress water system capacity. The major limitation on these days is often that the peak demand exceeds either treatment plant or transmission capacities. Most water systems have been designed to meet these peak events, which means that they are not unduly stressed during the rest of the annual usage pattern, unless there is a volumetric constraint associated with summer storage. Within the Portland system there is a volumetric constraint which can and has been brought about by very long hot summers when streamflows are low (as occurred in 1992 when streamflows in the Bull Run were the lowest on record). The Portland Columbia South Shore wellfield was constructed to ensure that these rare hot summer events would not constrain the availability of water to meet demands. However, in 1992 this system was not available due to concerns about the movement of groundwater contamination found within the potential area of influence due to pumping the Portland wells. When this supplemental system is returned to capacity the Portland system is not vulnerable to storage limitations as it was in 1992.

A more direct comparison of the average daily demands of the Portland water supply system (which serves the City of Portland and 19 other wholesale districts and cities) would show that the average winter season use is approximately 100 MGD, the average summer season use is about 135 MGD, while peak day is slightly over 200 MGD. The current installed capacity is more than adequate to serve these level of needs. The JWC is in the process of expanding their capacity from 43.5 to 63.5 MGD. The attached chart shows the current and expected increase in peak day capacities for the region as a whole.

The Impact of electronics industry market sector on the regions water systems and future planning

Supply system impacts

For the last four years the Portland Water Bureau, 26 other water providers throughout the region, and Metro, have been involved in a long-term planning process looking at the water demand/supply needs of the region over the next 55 years. Based on Metro's forecast for growth in households and employment, the water necessary to support new uses has been anticipated and accommodated within a range of demand forecasts currently being used to plan for water efficiency improvements, conservation, and the development of additions to the region's water supply

system. As of September of 1995 a preliminary Regional Water Supply Plan report is being circulated for public review and comment.

The demand forecasts used in the preliminary RWSP are based on the Metro projections, they reflect the historical water consumption patterns of the individual participants in the study. To the extent that Portland's past consumption history contains a segment of high water users (As stated earlier about 20% of the industrial/commercial account water usage comes from the top ten customers) within the non-residential water sector then the forecast projects an increase in that larger water use segment. Therefore the forecast will account for some increase in the high water user market. In addition, the preliminary RWSP also used the conservative approach of modeling the high water demands overall throughout the planning horizon. It contains strategies which allow the timing of programs and new supplies to be adjusted over time for changes in the rate of growth.

When high peak day water demand forecasts (the highest demands expected) are compared with the installed and committed base capacities (see attached chart) there seems to be adequate capacities overall to meet demands until after about 2020. A more relevant comparison would be to compare the demands on the two water systems currently most impacted by high tech firm demands. An examination of the demand forecasts for the areas currently served by these two systems would indicate that again more than adequate capacity exists between the two systems to serve these projected demands to the year 2015. For the Portland system specifically, current contracts with the 19 outside wholesalers will expire in about 2005 and so the overall reliance upon this system will be determined as contracts are renewed. Again, regionally the system capacities included within the base capacities are more than enough to provide service for the levels of demands projected in the preliminary RWSP.

As was noted in earlier news coverage and in the Multnomah County SIP background paper, it is true that the RWSP forecasts do not account for all of the sudden increase which could be represented by the potential high tech market sector. The increases represented by the estimate of total use 19.3 mgd represents an as yet undeveloped real increase of about 16.6 MGD by the year 2015. The forecast accounts for some portion of this increase, but probably not the full impact of it. The high forecast anticipates a real overall increase between 1995 and 2015 of 87 mgd for peak day, 39 mgd over the peak season, and 18 mgd for the winter season. Some of these increases are allocated to high demand water users, such as hospitals, schools, larger industrial customers. The reality of how much of this segment of the forecast actually happening (such as more hospitals or particularly more institutional outdoor watering for parks systems) is that a good portion of this part of the forecast could actually be taken up by the larger industrial customers. However, it is not possible to say exactly how much of the regional forecast for non-residential accounts was actually attributed to large water using firms. What can be said is that in the year 2015 the regional demand forecast allocates 60% to residential growth and 40% to growth in all other customer classes which include industrial, commercial, and institutional uses. Another factor is that the high forecast is based upon the maintenance of a very high residential growth rate over the 20 year period of 1995-2015, a proposition not supported by the region's or the nation's historical record. The high forecast of the RWSP therefore does contain some portion that

was intended to represent high tech firms and within the margin of error some additional part of it would not be used for the sectors identified. The high tech demands are largely uniform throughout the year. The portion of the peak season use represented by a potential additional high tech segment of 16.6 MGD compared to the projected regional increases of 39 MGD would indicate that the forecast does not fully account for this large of a shift in customer class. For example, if one assumes that as much as 1/3 of the high tech demand could be accommodated by the RWSP forecast then the other 2/3's or about 11 mgd is unanticipated by the RWSP demand forecast.

The recommended strategies contained in the preliminary RWSP assume an increase of peak day capacity for the region's water systems of 80 mgd by the year 2005. The preliminary RWSP further identifies that the region's major area of future potential shortages are in the area of peak event or peak day system capacity. With the committed regional base capacity of 493 MGD the high peak day forecast shows a need to look for additional supplies after the year 2017. If one were to use the above example of assuming a shortfall of 11 mgd which might be attributed to an underestimate of high tech demand, then major impact of this would be to move up the need to examine peak day installed capacities by a couple of years. This statement is only true if the high tech consumption patterns follow the high side estimate and if the region continues to grow at the high rate. It is still very likely that high tech demands will be lower than estimated due to recycling and conservation processes within these facilities, a tendency for actual water demands to be lower than projected before development, and the possible use of non-potable supplies being developed for some portion of these uses.

The preliminary RWSP contains a number of alternative long term resource strategies for meeting future demands, as well as recommendations for exploration of non-potable supplies to meet some of these needs. The plan is intended to be a flexible document which will be revised over time as demand patterns materialize, system improvements are made, and technologies change in the arenas of recycling and non-potable water supplies.

Revenue stream impacts

Another factor should be considered in the discussion of high tech firm impacts. The system development charges paid by these firms are considerable and can go some distance towards paying for the improvements needed to support them. In addition, as noted earlier, the revenues received by service providers from the annual usage charges for users of this size are considerable. The steady income over an annual period represented by this type of consumption pattern does yield significant benefits to the utility entity and its customers. For most municipal water suppliers the largest segment of the cost of service in any given year are fixed operating costs which do not vary to a great extent from winter to summer or with the actual amount of water passed through the system. As a result, the system has higher costs due to the installation, maintenance, and operation of facilities designed to meet peak needs which do not occur very often throughout the year. Revenue streams therefore reflect the peaking nature of residential outdoor water use patterns. Customers that have a steady demand throughout the year, particularly during the majority of time when the system is underutilized, will shift

revenues which must be collected to cover the fixed operating costs of the system. The net result is that a larger industrial sector using similar amounts of water year round will reduce the need to collect as much revenue from the residential customer class. Revenue streams that are less reliant on peaking patterns that reflect unpredictable weather patterns provide more certainty for financial planning and forecasting. Increased certainty make it easier to operate the system and finance needed improvements that require revenue bonding over long time periods.

Conclusion

This paper has presented several facets of the water use impacts of high tech electronics firms locating in the Portland metropolitan area. It is not a crystal clear picture and there are several variables which will factor in the ultimate impacts that are seen. What is clear is that the development of some or all of companies and sites identified will mean that this customer segment will become the largest single industrial water using sector in the region by the year 2015. The size of this sector is not overwhelming in relationship to the total demands on the municipal water systems in the region. Out of a total potential peak season regional demand of 262 MGD by the year 2015 a high tech sector of as much as 20-22 MGD would be about 8%. On a peak day the proportion represented by high tech firms would be less (about 5%). For the two water systems (Portland and the Joint Water Commission) most likely to serve these users the installed capacities of these systems are sufficient over the near term. However, contract renewal for the Portland water system will need to take the increases due to this market sector into account. The net result of the high tech sector could be to accelerate the requirement of additional regional supplies by at most a couple of years, and to shift the revenue stream from residential customers to the industrial sector for those utilities serving the high tech firms. The financial result of this would be to provide a more stable and predictable revenue stream which would assist in bonding for needed improvements.

Table VI-1
REGIONAL WATER SUPPLY PLAN
EXISTING AND COMMITTED SUPPLY SOURCES

Source	Existing		Additional Committed		Existing and Committed	
	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)	Delivery Capacity (mgd)	Usable Storage Capacity (mg)
Bull Run Res 1,2	210	10,200			210	10,200
Clackamas						
CRW	30				30	
SFWB	20		10		30	
Lake Oswego	16		4		20	
Oak Lodge			8.5		8.5	
Subtotal	66		22.5		88.5	
Trask/Tualatin	43.5	1,153	20	5,214	63.5	6,367
Southshore Wellfield	35		37		72	
Local Sources						
South	28.4				28.4	
West	12.8				12.8	
East	18.1				18.1	
Subtotal	59.3				59.3	
Total	413.8	11,353	79.5	5,214	493.3	16,567

Source: Regional Water Supply Plan, Preliminary Report, August 1995

High Tech Water Use and Installed Capacities

Figure #1

	1995	
High Tech Water Demands	Regional Installed Capacities	% Utilized by High Tech Firms
2.7 MGD	413 MGD	.6%

	2015	
High Tech Water Demands	Regional Installed Capacities	% Utilized by High Tech Firms
19.3 MGD	493 MGD	3.9%

Figure #2

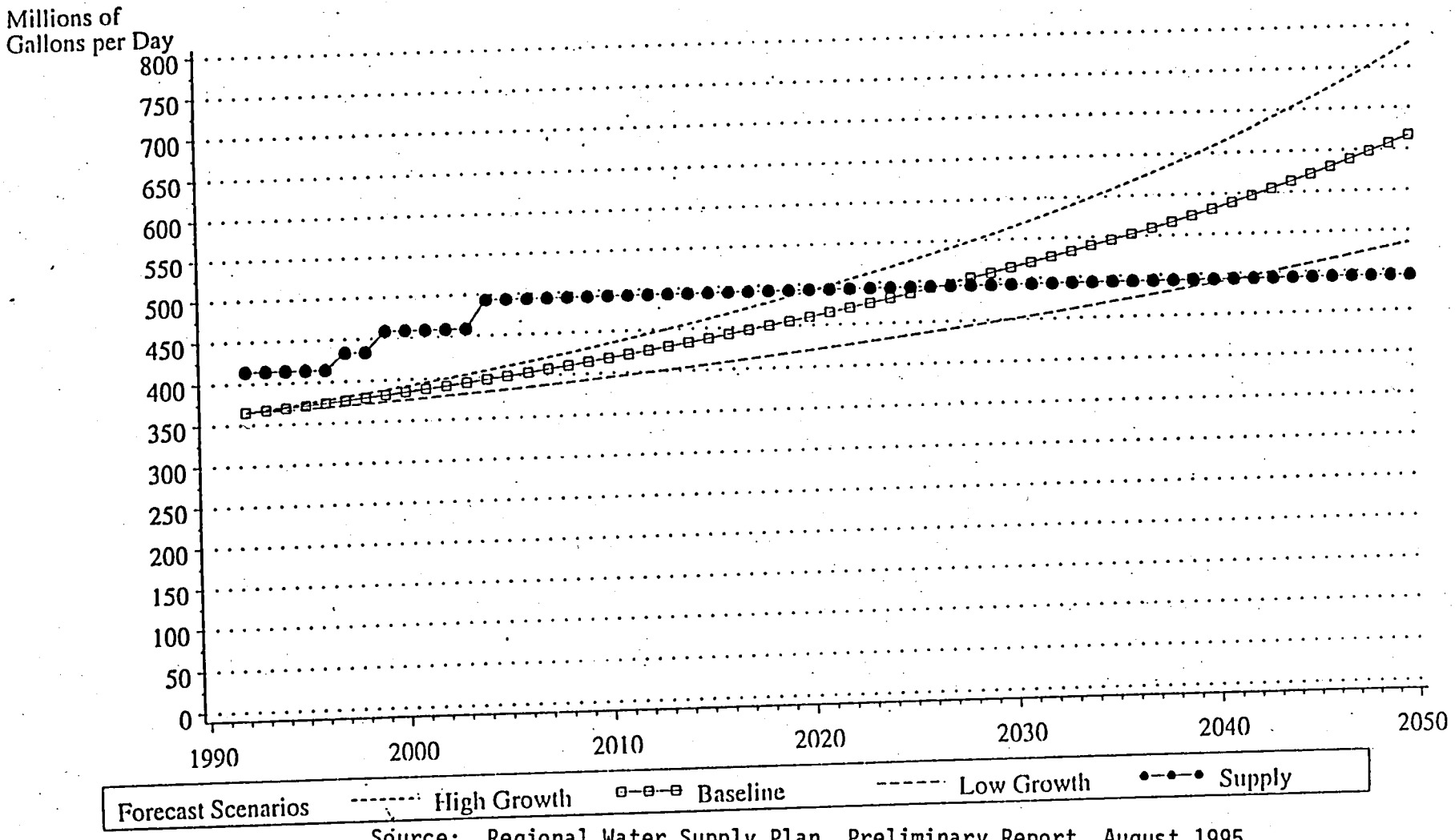
	1995	2015
High Forecast (Regional) Peak Season Demands	223 MGD	262 MGD
% High Tech Demand*	1.2%	7.3%
High Forecast (Regional) Peak Day Demands	374 MGD	462 MGD
% High Tech Demand*	.7%	4.1%

*The high tech demands are not shown peaking but as annual straight daily demands based on the highest numbers available. In addition the %'s used do not reflect an increase in the forecast itself to account for all of the possible high tech demands.

Figure ES-1

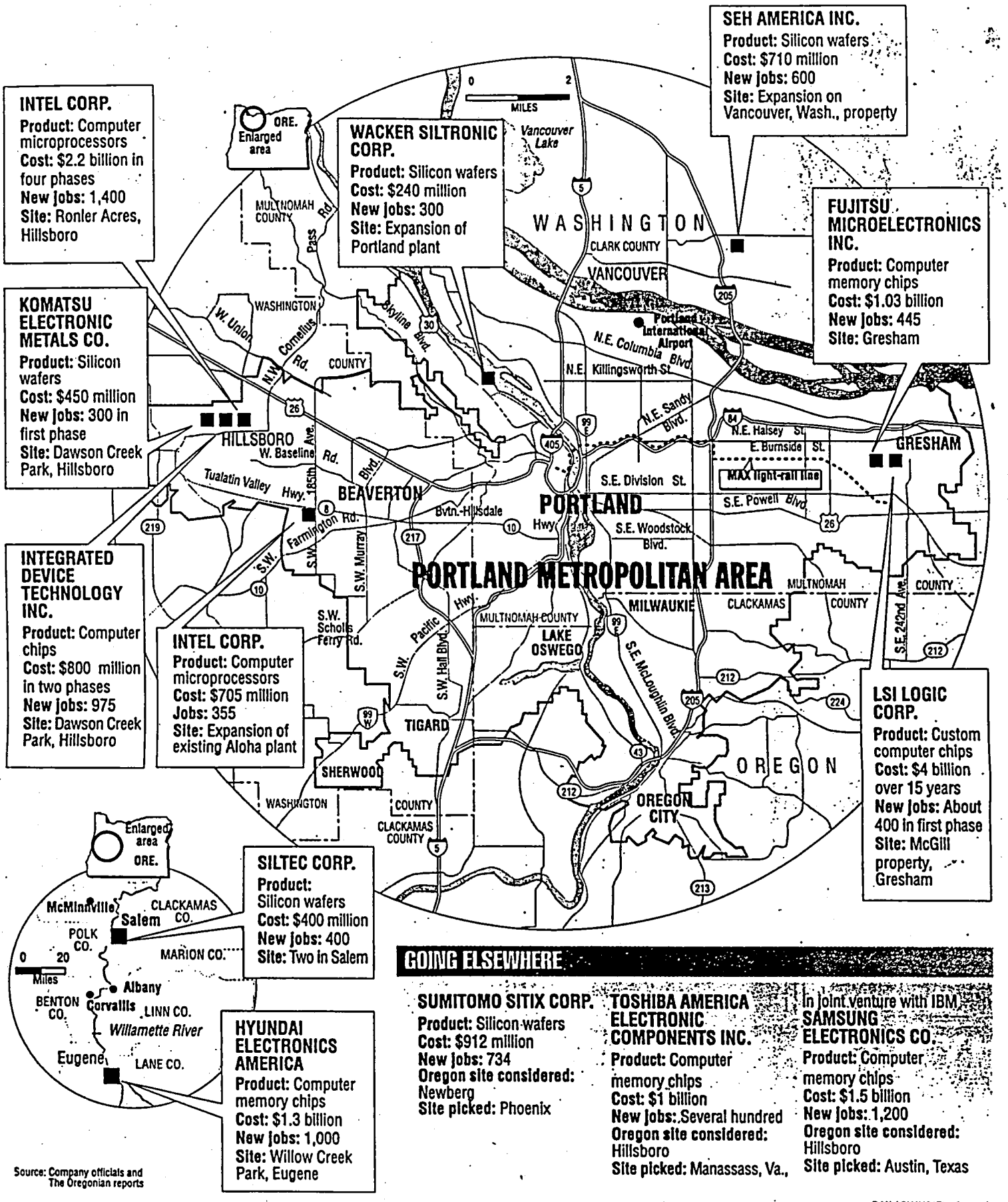
Comparison of Regional Peak-Day Demand To Existing and Committed Supply

Portland Metropolitan Region
1992--2050: All Customer Classes



Source: Regional Water Supply Plan, Preliminary Report, August 1995

01AUG95



GOING ELSEWHERE

SUMITOMO SITIX CORP.
Product: Silicon wafers
Cost: $912 million
New jobs: 734
Oregon site considered: Newberg
Site picked: Phoenix

TOSHIBA AMERICA ELECTRONIC COMPONENTS INC.
Product: Computer memory chips
Cost: $1 billion
New jobs: Several hundred
Oregon site considered: Hillsboro
Site picked: Manassass, Va.,

SAMSUNG ELECTRONICS CO.
In joint venture with IBM
Product: Computer memory chips
Cost: $1.5 billion
New jobs: 1,200
Oregon site considered: Hillsboro
Site picked: Austin, Texas

Source: Company officials and The Oregonian reports

DAN AGUAYO/ The Oregonian

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October 25, 1995

The Metro Council
600 NE Grand Avenue
Portland, OR 97232

To the Council:

I am writing in my role as Multnomah County Health Officer to give input to your deliberations on long term water supply options for the Metro Region. I am offering my comments in writing because I will be unable to attend the Council's hearing on October 26, 1995.

First I want to state my overall support for the job done by the Regional Water Purveyors' Group. I believe they have done a good job in considering many of the complex issues involved in supplying water to our growing metropolitan area. In particular, I think they have done a reasonable job in seeking public input and in developing a rational decision making framework. The process has come a long way since its inception in 1991.

I believe that the recommended option (Option 1.5) has many reasonable features. However, I am concerned about the planned use of the Willamette River to add two increments of water supply in the coming decades.

Instead, I think the supply plan should emphasize use of sources with the highest raw water quality. The rationale for my opinion has two bases.

First, sources such as the Bull Run and other sources with high raw water quality are "known quantities." Their health risk potentials are well characterized. We know much about their current contamination levels (which are minimal). We also can depend on the protected status of these watersheds to minimize the possibility of future contamination.

Second, the decisions our communities make about water supply will play out over a period of decades. This time frame represents an opportunity for local government, including Metro to be forward-looking and protective of the health of its citizens. Under the favored supply plan, the Willamette River would not be tapped for roughly 40 years. This is about how long it takes for our society to discover and appropriately respond to toxins in the environment. The case of DDT

is a good example. Substantial manufacturing of DDT began in the late 1930's. DDT was used widely throughout the 1940's and 1950's. It was not until the 1960's that it was discovered to be toxic to certain animal species, and it was not until 1972 that the use of DDT was largely banned. DDT was not listed as a hazardous substance by the EPA until the mid 1980's.

While the pace of scientific discovery has increased, we probably will not appreciate many of the human health effects of contaminants found in rivers like the Willamette for 20 or more years. It will likely take this long to catalogue actual contamination, and define its health hazards. In light of this, the decisions we make today should be colored by knowledge of what we do *not* know, as well as what we do know.

I appreciate that the preferred water supply plan represents a compromise among several competing legitimate policy goals. Never the less, when the plan includes a contaminated source such as the Willamette, I think it is important to examine the nature of compromise and the relative social and financial costs and benefits that are involved.

Thank you for the opportunity to share my thoughts with you. If you have any questions please contact me.

Sincerely,

Gary L. Oxman, MD, MPH
Health Officer

c: Billi Odegaard, Health Department Director

[j]c:\...gary\metro ltr

OSPIRG
Oregon State Public Interest Research Group
1536 SE 11th Avenue, Portland, OR 97214 (503)231-4181 • fax (503)231-4007

Remarks of Randy Tucker
Environmental Advocate, Oregon State Public Interest Research Group
Metro, October 26, 1995

Good evening. My name is Randy Tucker and I'm here representing the 30,000 members of the Oregon State Public Interest Research Group, a statewide, non-profit, non-partisan consumer and environmental organization. OSPIRG has long been interested in questions of water quality, which relate directly to our concerns with environmental protection, public health, and consumer equity. We thus appreciate the opportunity to comment on the Regional Water Supply Plan.

While we are continuing to examine the many complex issues related to the development of a water supply strategy for our region, we would like to set forth some principles which we hope will be incorporated into the final plan. We are concerned that despite the hard work and best intentions of the regional water providers, the plan in its current form does not adhere to these principles.

Briefly stated, our concerns relate to water quality and public health, conservation, equity, and the decision process itself. These issues are closely intertwined, but I will try to discuss them one by one.

Water Quality: First, regarding water quality and public health, OSPIRG's main concern is that all residents of the region continue to receive drinking water of the highest quality, even as the region's population and economy grow. In light of increasing overall demand, this may well require steps to decouple drinking water sources from non-potable supplies.

The Plan, on page 23, indicates that "[T]he water providers have not attempted to prioritize policy objectives." In fact, however, the planners do seem to have implicitly chosen so-called Level I reliability, rather than water quality, as their top priority. Certainly the preferred alternative, Strategy 1.5, does not feature high water quality as one of its principal attributes. We have serious questions as to whether the public is less concerned with the quality of their drinking water than with the possibility that they might not be able to water their lawns or wash their cars for a couple of days every few years. In our view, the purity of the region's drinking water should take priority over certain other objectives like cost and Level I reliability. At the very least, the people of Portland need the opportunity to choose their priorities with a full understanding of the trade-offs involved.

One step toward achieving the goal of continued high drinking water quality would be to reserve as much as possible of our purest water for drinking and other personal uses. This will require further investigation into alternate systems for industrial and outdoor use—*before* the adoption of a supply strategy begins to foreclose our options. We specifically would oppose any plan that sacrifices drinking water quality for the growth of water-intensive industrial development and wasteful outdoor irrigation.

We share the specific apprehension that many have expressed recently about the prospect of using the Willamette River for drinking water. We are also concerned about the aquifer storage and recovery option that has been included in the plan. Obtaining drinking water from the uppermost aquifer in a groundwater system presents a danger of contamination from surface land uses, either in an urbanized area from road runoff and other wastes, or in an agricultural area from farm chemicals. There is also a danger that the injection of chlorinated water into aquifers will result in the creation of trihalomethane. While we are hopeful that these issues can be resolved, we are hesitant to rely on ASR for drinking water until further study can provide better answers to water quality questions than are currently available.

We are also troubled by the plan's insistence that water from proposed sources can be made to satisfy federal drinking water standards. In a political atmosphere where leaders in Congress are working to weaken the federal Safe Drinking Water Act and Clean Water Act, we believe that mere adherence to federal standards is not a sufficient quality threshhold to aim for. This is especially critical when we consider vulnerable populations like children, the elderly, and people with weakened immune systems. In fact, no federal standards currently exist for many industrial and agricultural chemicals, and those standards that do exist are in many cases least-common-denominator measures which were not devised with Portland's pure water in mind. Our pristine water has so far allowed us to overlook the serious public health problems often associated with drinking water in other areas of the country. Instead of relying on weak federal standards, we should set a goal of maintaining our drinking water quality at its current high levels.

Conservation: Second, we applaud the planners for recommending aggressive conservation efforts, and in fact for assuming that conservation will be the basis of any plan we adopt. To the extent that conservation can delay or alleviate the need for new sources, it will be a critical factor in helping to maintain the availability of high-quality water for human consumption. It also embodies the principle that we must learn to live within the region's carrying capacity rather than forever seeking artificial ways to expand that capacity.

However, the conservation section of the preliminary report seems incomplete in that it does not lay out any strategy for ensuring that all jurisdictions and providers in the service area will in fact adopt sufficiently stringent conservation plans. Just as the 2040 process will require the various governments in the region to adopt growth

management policies compatible with regional priorities, the Regional Water Supply Plan should formalize serious and equitable commitments to conservation by all participating jurisdictions. We also encourage you to further investigate the potential for using aggressive pricing structures as an incentive for conservation.

Equity: Third, when we speak of equity, we refer to the fair distribution of the economic costs and other burdens of our water system, both geographically across the region and between residential and industrial users. We urge you to insist that the ultimate supply plan will equitably distribute water quality, economic costs, and the burden of conservation among the various jurisdictions and suppliers in the region.

We are especially concerned about the recent tendency of certain jurisdictions, encouraged by the Oregon Economic Development Department, Portland Development Commission, and others, to offer tax breaks to large water-intensive manufacturing facilities with scant regard to the implications for regional water supply. Estimates of the future growth of the computer chip industry in the region vary widely, and we need to ensure that the growth of this and other industries does not mean that we'll be drinking out of the Willamette while our precious Bull Run water is squandered on industrial uses.

In the interest of making growth pay for itself, we should require large new users to draw on sources other than Bull Run. This should especially apply to companies receiving tax abatements under the Strategic Investment Program. Not only are these companies receiving a large public subsidy, but the cap on tax assessments means that any infrastructure investment they make in water supply systems will not increase their property taxes. Shifting current large industrial users to alternate sources could further protect the supply of drinking water for the citizens of the region.

Also in the interest of making growth pay its way, new residential development should be built with the capability to use dual water systems. While we do not begrudge top-quality drinking water to anyone in the region, we do believe that watering large lawns and flushing toilets is not the highest and best use of the purest drinking water in the world, and we should explore mandates to that effect.

Process/Public Participation: Finally, we are concerned that the schedule that has been proposed for final adoption of a regional water supply plan may not leave sufficient time to address the significant questions that remain and to involve the public adequately in the process. While we appreciate the good faith efforts of the planners to reach out to citizens of the region, in our view, the vast majority of citizens remain unaware of the the importance and speed—not to mention the very existence—of the current process.

We appreciate the assurances offered by the providers that any plan will be implemented gradually and incrementally. Certainly the magnitude of these

decisions and the complexity of the issues demand that we not rush forward under the pressure of an artificial deadline, but take the time necessary to ensure that residents of the region truly understand and support the choices that they are being asked to make.

Metro has demonstrated the importance of citizen input throughout the 2040 process. We hope you will take the opportunity not only to redirect the planners to develop a water supply plan that more accurately reflects community values, but also to ensure that a more open and deliberate process reaches a publicly acceptable conclusion. OSPIRG looks forward to working with you as that process continues.

Roderick Haig-Brown Habitat and Conservation Chapter

Association of Northwest Steelheaders

Guy Orcutt – Communications Director
4041 NE 22nd • Portland, OR 97212 • 280-0413 (voice only)

METRO Water Use Versus Fisheries in Northwest Oregon

Testimony before METRO — October 26, 1995

I have supported regional planning as the way to achieve a livable future in a highly populated, fast growing, urban area, but when I see urban water use expanding to the certain detriment of fisheries I have to question the goals of that planning.

I am a member of the Association of Northwest Steelheaders.

I was instrumental in securing official Association of Northwest Steelheaders endorsement for the recent campaign to purchase open space.

As fisheries advocates, Steelheaders backed that campaign because we favor preservation of fish habitat, but we understand that stream habitat is worthless without water. Water quantity is the single most important factor in determining fish abundance. No negative impact can be more detrimental to fish production than loss of water

For a local example of that consider the fact that loss of habitat and water due to Portland's Bull Run water supply accounts for a 50% reduction in the Sandy System's fishery. This amounts to a loss of tens of thousands of returning adult fish every year, at an annual cost to our region of tens of millions of dollars.

Our urban area sits at the center of one of the world's great complexes of salmon and steelhead producing rivers. Our location leaves us perfectly situated to destroy or to restore a fisheries wonder. METRO's leadership in water conservation is essential.

Urban/suburban design is what METRO is all about, but to date we have designed cities and suburbs to waste water. To make up for this waste, we import all the water we want from the Cascades and the Coast Range. We seek to redress our destruction of water resources through complex environmental regulations; but regulations can not bring back wasted water.

We need a lot more of what METRO was conceived to do — intelligent systems design.

While making decisions about water use, please consider the following:

First, we are importing water from the mountains to replace the water we pollute in the city.

Second, we could find water here at home. More water runs off my roof in a single rainy season than I use in years. By redesigning buildings and streets, we can convert a waste disposal problem into a precious resource.

Third, conservation is our best source for water. During the past drought Portland cut water use by nearly 50%. 50% is a realistic conservation figure for the immediate future because we have proved that we can achieve it right away.

If salmon are to be part of our future we must stop asking, "Where can we get more water?" The question should be, "How do we design cities and buildings to live with the water we have."

Joseph L. Miller Jr.,
52815 E. Marmot Rd.,
Sandy, OR, 97055 (668-4497)

Oct. 26,1995

Commissioner Mike Lindberg,
City Hall,
1220 SW 5th Ave.,
Portland, OR, 97204

Dear Commissioner Lindberg:

Re: Holding on to existing option for Portland to use entire uninhabited Little Sandy as future protected water source

(Ref.: Council Resol. Mo. 35203, p.4 and Exhibit I; Oct. 20,1993)

On July 19,1995 Roberta Motltzen informed me of a recent inquiry as to the F.S. having an interest in acquiring an 80-acre parcel adjacent to the Forest Boundary near Marmot. (She said the Forest Service had determined against acquiring it.)

Just yesterday I received large maps showing the location of this parcel. I have tried to copy pertinent portions, adding to them info from a map offered at a meeting of in 1978 of the Bull Run Advisory Committee showing an option for an impoundment in this area that would hold water from the only the uninhabited Little Sandy. This was a little way upstream from the entry of Aschoff Creek, as envisioned in Council Resolution No. 35203.

My worry about this 80-acre parcel is, that even though it is downstream from this proposed impoundment, it straddles the Little Sandy. Presumably conduits would pass through this parcel. It would be tragic to have this present a future obstacle to Portland using this water source.

A key advantage of the Little Sandy is that water from it could be conducted by new, separate conduits, engineered and located to add reliability to Portland's sole source of pure water, in case of damage to the present conduits.

An additional advantage of such separate conduits would be that construction activities on it (unlike on a third reservoir in Bull Run) would not endanger the quality of Portland's present water source.

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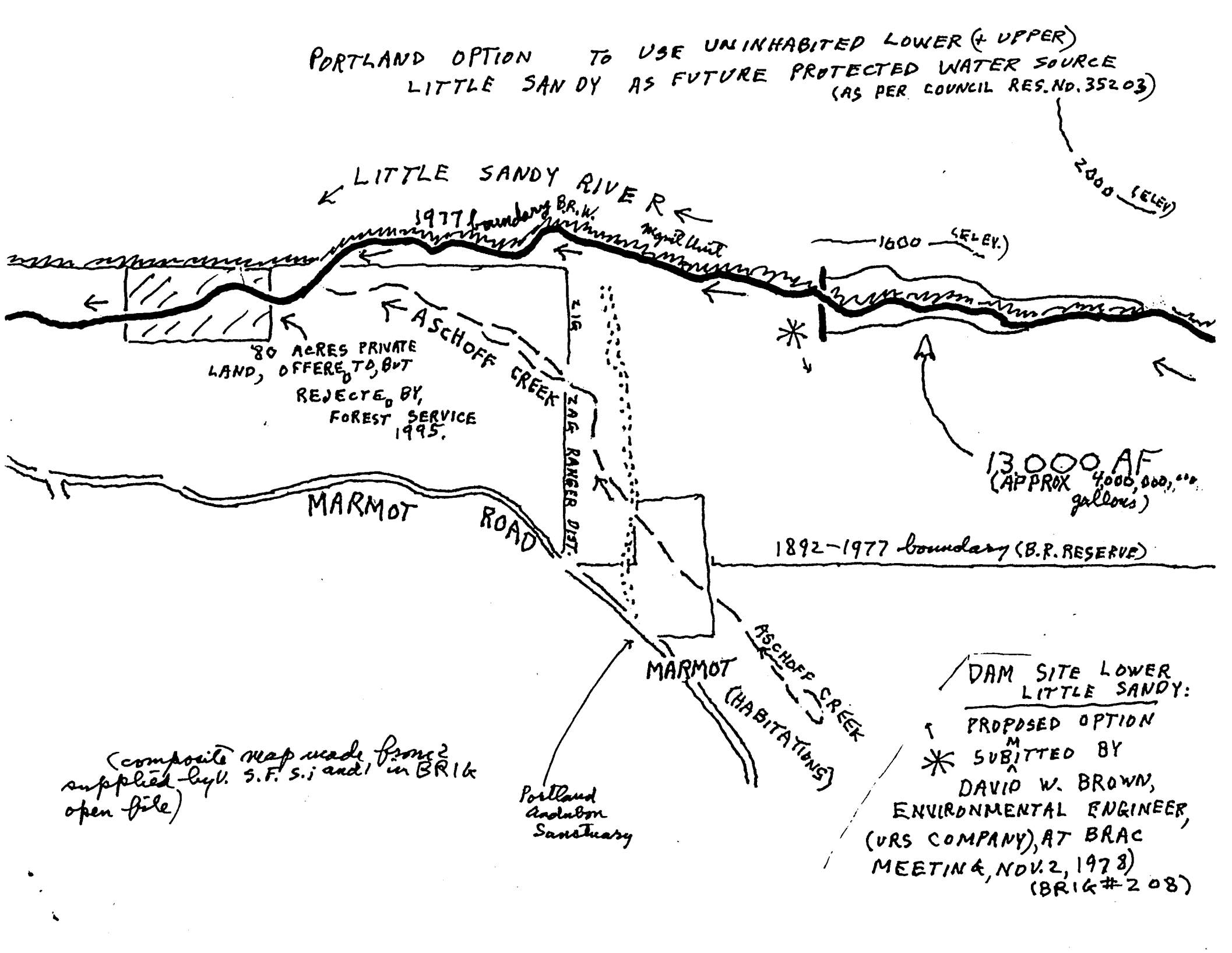
Please continue to be aware, Commissioner Lindberg, that many citizens support the concept of protecting our potentially naturally pure and cheap water sources. But, they have to me made aware of what is going on; and given opportunities for expression out in the open before decisions are finalized.

Thank you very much for your past efforts along this line.

Sincerely, Joseph L. Miller Jr. M.D. (ret)

Joseph L. Miller Jr., M.D.(retired)

Encl: map
Copy: to Roberta Moltzen


PORTLAND OPTION TO USE UNINHABITED LOWER (+ UPPER)
LITTLE SANDY AS FUTURE PROTECTED WATER SOURCE
(AS PER COUNCIL RES. NO. 35203)
LITTLE SANDY RIVER
2000 (ELEV)
1977 boundary BR.W.
Mgmt Unit
1600 (ELEV.)
ASCHOFF CREEK
SEC
ZAG RANGER DIST.
80 ACRES PRIVATE LAND, OFFERED TO, BUT REJECTED BY, FOREST SERVICE 1995.
13,000 AF (APPROX 4,000,000,000 gallons)
MARMOT ROAD
1892-1977 boundary (B.R. RESERVE)
ASCHOFF CREEK
MARMOT (HABITATIONS)
Portland Audubon Sanctuary
(composite map made from 2 supplied by U.S.F.S. and in BRIC open file)
DAM SITE LOWER LITTLE SANDY:
PROPOSED OPTION
SUBMITTED BY
DAVID W. BROWN, ENVIRONMENTAL ENGINEER, (URS COMPANY), AT BRAC MEETING, NOV. 2, 1978)
(BRIC #208)

600 NORTHEAST GRAND AVENUE | PORTLAND, OREGON 97232 2736
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REGIONAL SERVICES

METRO

RUTH MCFARLAND
METRO COUNCIL, DISTRICT 1

October 26, 1995

Dear Water Resources Policy Advisory Committee Members:

Re: Upcoming Meeting

The next meeting of the Water Resources Policy Advisory Committee (WRPAC) meeting will be held on Monday, November 6, 1995 at 1:00 p.m. at Metro.

This meeting will focus on Region 2040 updates and its overarching regional measures (see enclosed WRPAC sub-committee recommendations), and the proposed work plan for the Region 2040 unbuildable lands analysis and water resource chapters of the Regional Framework Plan. A copy of the proposed work plan will be mailed to you next week. The two WRPAC subcommittees have met since our last meeting and they will report back to the committee. A proposal will also be made by staff regarding future WRPAC committee membership, committee structure and coordination with MTAC and MPAC.

Please find the enclosed agenda for the upcoming meeting. I look forward to your technical comments and responses to these studies. Your participation in this meeting is important. Please contact Rosemary Furfey at 797-1726, if you have questions or require additional information.

Sincerely,

John Fregonese
Growth Management Services Director

JF/RF/srb
I:\GM\RF\WRPACNOV.WPD

Enclosures

cc: Interested Persons

M E M O R A N D U M

METRO

Date: October 25, 1995

To: John Fregonese, Growth Management Services Director
Mark Turpel, Land Use Planning Supervisor

From: Rosemary Furfey, Senior Regional Planner
Growth Management Services

Regarding: **Region 2040 Overarching Regional Measures**

The Water Resources Policy Advisory Committee (WRPAC) appointed a sub-committee to review the Region 2040 Overarching Regional Measures at its recent meeting on October 11, 1995. The sub-committee was asked to review the measures and recommend additional language that it felt was appropriate to address water resource issues.

The sub-committee met on Friday October 20, 1995 and after lengthy discussion agreed on several changes to the overarching measures. WRPAC members chose to use language consistent with the Regional Urban Growth Goals and Objectives (RUGGOs) wherever possible. The sub-committee circulated its recommendations to all WRPAC committee members for their review. The attached language is the culmination of this review process and is now being forwarded to the Metro Policy Advisory Committee (MPAC) for its meeting on Wednesday October 25, 1995.

I will be glad to answer any questions you have regarding these suggestions.

DRAFT
INTERIM MEASURES

Overarching Regional Measures

These overarching measures, if adopted by the Metro Council after review and participation by local jurisdictions, would become the elements of a Metro functional plan for urban growth management. Metro staff will be recommending that the functional plan be considered by the Metro Council with a goal of adoption by Spring 1996. If the Metro Council does adopt an urban growth functional plan, it would also be recommended that cities and counties would need to show compliance with the Overarching Regional Measures within 18 months of Metro Council adoption, approximately Fall 1997.

After adoption of an Urban Growth Functional Plan, and in the event that a city or county believes that compliance with one or more of the regionwide measures is not feasible, they may ask for a mediated settlement. Metro and the local jurisdiction would use a jointly selected third party to intervene in the conflict. Should efforts to mediate differences between the Metro function plan and local considerations not resolve compliance issues, the local jurisdiction may bring the issue to the Metro Policy Advisory Committee (MPAC) for review and recommendations. After MPAC consideration, the matter would be considered by and acted on by the Metro Council. (As provided in the RUGGO Objective 5.3 "Functional Plan Implementation and Conflict Resolution.")

The following measures are recommended for region-wide adoption:

Measure 1. Change zoning maps to implement the Metro Growth Concept.

Expected Outcome - The Metro 2040 Growth Concept is implemented by ensuring local zoning will accommodate the jurisdiction's portion of the regional growth capacity.

Performance Standard - That the overall total population and employment targets for the jurisdiction or the jurisdiction's planning area from the Metro 2015 Growth Forecast are permitted or will be permitted at densities and locations likely to be achieved, following the Metro 2040 Growth Concept.

Guidelines - A city or county may demonstrate conformance with the performance standard above or show that zoning for all lands within the jurisdiction or the jurisdiction's planning area are consistent with the Metro 2040 Analysis Map. Local work should include review of development code standards to ensure that stated densities can actually be built. Examination of street and alley standards, setbacks, landscaping requirements, lot coverage and other standards which could reduce the otherwise permitted density or floor area ratio should be completed. Consider innovative and cost saving solutions to stormwater management, including allowing for building at densities which incorporate landscaping that serves other multi-objective purposes. Create incentives to promote innovative and cost-effective site design.

Measure 2. Change zoning text to provide for mixed-uses and compact urban designs in station areas, regional and town centers, mainstreets and corridors.

Expected Outcome - Centers, mainstreets, station areas and corridors will accommodate their expected portion of growth in a manner consistent with the mixed use center designs of the

Metro 2040 Growth Concept. Development and redevelopment in the region will be much more compact and pedestrian and transit friendly. These features would encourage continuation of: the protection of agricultural lands outside the Urban Growth Boundary, a strengthened sense of community, reduced vehicle miles traveled and lessened air and water pollution.

Performance Standard - Cities and counties shall demonstrate that the regulations affecting development and redevelopment within their jurisdictions' station areas, regional and town centers, mainstreets and corridors will meet employment and household targets for these design types within their jurisdiction and will be designed to be compact, mixed-use urban designs that are pedestrian and transit friendly.

Guidelines - Cities and counties may:

a. demonstrate that the growth capacity and transportation performance is equal to or greater than the Metro 2040 Analysis Map and 2015 Growth Forecast for household and employment, or
b. demonstrate the following:

Mixed Use
- allow mixed uses in station areas, regional and town centers, mainstreets and corridors;

Allowed Uses
In regional and town centers, station areas (or those planned and for which funding is identified), corridors (continuous or nodal as described in the Metro 2040 Growth Concept) and mainstreets:
- allow residential, retail and service uses, restaurants, medical professional offices, clinics, neighborhood civic and institutional uses, indoor recreational and entertainment uses;
- permit multiple uses on one property;
- prohibit storage as main use, vehicle sales or service uses, outdoor commercial recreational uses, outside storage (except in corridors where such uses may be allowed);
- implement the design features of the Transportation Planning Rule.

Densities/Use Intensity
In regional and town centers, existing station areas (or those planned and for which funding is identified), corridors and mainstreets, developments should:
- have a minimum residential density of 15 units acre;
- increase maximum density to 45 units acre;
- have a minimum Floor Area Ratio of 0.5 new office and civic/institutional uses;
- have a minimum Floor Area Ratio of 0.4 for all other permitted uses and combinations of any permitted uses;
- ensure that minimum density requirements may be applied to the sum of contiguous lots that are part of the same development project;
- allow for density transfer to preserve open space and address water quality and stormwater management;
- establish a minimum density for redeveloping sites as the existing density of current use (on larger sites, where a masterplan for the entire site achieving minimum densities is approved, development may proceed in phases);
- examine water and sewer infrastructure capabilities.

Parking[1]

- remove or reduce minimum requirements (see Gresham requirements);
- require no more than 2.9 to 3.5 spaces per 1000 square feet (adjust for building size) or less for retail uses;
- require no more than 2.5 spaces per 1000 square feet or less for office uses;
- require no more than 1.5 or less for centers, mainstreets and station areas or less for residential uses;
- establish public parking facilities;
- allow shared parking reductions;
- link reduced standards to FAR - higher density enables lower standard;
- limit private, offstreet surface parking to a maximum of 150 percent of the minimum (excepting public parking and/or structure parking);
- require masterplans which indicate how the site could further reduce parking spaces over time, replacing parking spaces for additional building space, should demand for parking spaces decrease or not be evident.

Measure 3. Protect, restore and enhance natural resources and water quality.

Expected Outcome - ~~That development within urban areas will retain critical elements of the natural landscape, especially stream corridors and wetlands, so that existing and new residents will continue to enjoy this aspect of our region's existing quality of life.~~ Manage watersheds to protect, restore and ensure to the maximum extent practicable the integrity of streams, wetlands and floodplains, and their multiple biological, physical and social values.

Performance Standard - Demonstrate that the continuation of the natural system of existing stream corridors and wetlands that are included in the Metro map of environmental constraints lands will be protected in their natural state to the extent practicable.

Guidelines - Possible measures may include protection and restoration of stream corridors and wetlands by:

- Allowing generous on-site density transfers to obtain urban densities while maintaining wetlands, floodplains, steep slopes, stream riparian areas and maximizing the zoning potential of the property by building on the remaining parts of the site.
- ~~Requiring and implementing best management practices (BMPs) to treat stormwater before discharging to natural waterbodies as a condition for receiving building permits for residential, commercial and industrial developments.~~ Require residential, commercial and industrial land use permits to implement measures that eliminate or mitigate nonpoint source pollution from those activities consistent with local management plans.
- ~~Requiring all transportation projects that result in a significant increase in impervious surfaces to address and eliminate where possible, mitigate where elimination is not possible, nonpoint pollution runoff to streams and wetlands (other than wetlands created for this purpose). All significant transportation projects which are adjacent to streams, wetlands, or other water bodies should be required to incorporate the use of appropriate passive treatment systems to reduce, to the maximum extent practicable, the conveyance of suspended sediments, oils, heavy metals and other pollutants to nearby water bodies.~~

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[1]This section will need additional consideration. It could be revised to consider a regionwide lowering of minimum parking standards and a DEQ voluntary maximum as an alternative to the above.

Require all transportation projects to implement measures that eliminate or mitigate nonpoint source pollution from those activities consistent with local stormwater management plans.

- directing Metro to address all state-wide goals, especially state Goal 5 compliance, for stream corridors and identified wetlands of regional significance.
- The regional planning process shall be used to coordinate the development of interconnected recreational and wildlife corridors within the metropolitan region.

Measure 4. Implement the rural reserve and green corridors.

Expected Outcome - Separation of neighboring communities, such as Sandy, Canby and North Plains from the Metro Urban Growth Boundary will be achieved. This is expected to enhance the sense of community for both the Metro area as well as neighboring cities and ensure that while growth is accommodated, that there is not limitless expanse of urban development.

Performance Standard - Adoption of intergovernmental agreements.

Guidelines -To the extent possible, Oregon cities outside the Metro Urban Growth Boundary could choose to enter into agreements with their county, ODOT, Metro and other affected agencies to designate common rural reserves between the Metro Urban Growth Boundary and the neighbor city urban growth boundary as well as designate common locations for green corridors along state highways.

RF/erb
I:\GM\RF\INTERIMW.WPD
10/23/95

A G E N D A

600 NORTHEAST GRAND AVENUE | PORTLAND, OREGON 97232 2736
TEL 503 797 1700 | FAX 503 797 1797

METRO

Meeting: ***Water Resources Policy Advisory Committee***

Day: Monday

Date: November 6, 1995

Time: 1:00 to 3:30 p.m.

Place: Metro Regional Center
Room 501 (take elevator at south end of building to 5th floor)
600 N.E. Grand Avenue
Portland, Oregon
(Parking available off Irving Street)

1:00 p.m. Welcome and Introductions — Councilor Susan McLain

1:10 p.m. Regional Updates — Metro Staff

1. Regional Water Supply Planning Study
2. Presentation on ***Survey of Natural Resource Tools In the Portland Metropolitan Region*** Report

1:40 p.m. Region 2040 Update and Issues — Metro Staff

1. Update on Upcoming Region 2040 Actions
2. Overarching Regional Measures
3. Unbuildable Lands Inventory
4. Update on 2015 Population Figures

BREAK

2:10 p.m. Regional Framework Plan — Metro Staff

1. Review Draft Work Plan
2. Discussion

3:10 p.m. WRPAC Membership and Structure — Metro Staff

1. Present Proposal
2. Discussion

Adjourn

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