Metro Environmental Audit

and

Sustainability Management System

June 2001

PERFORMANCE ADVISORS, INC.

Contents

Executive Summary **3**
Background 3
Major findings 4
General recommendations 6
Paths to sustainable energy and water use 6
Top 3 recommendations 9
Legend for specific recommendations 10
Common facility recommendations 10
Energy savings summary 12
Metro Regional Center **13**
Findings 13
Recommendations 13
Expo **15**
Findings 15
Recommendations 15
Portland Center for the Performing Arts **17**
Findings 17
Recommendations 18
Oregon Convention Center **19**
Findings 19
Recommendations 19
Transportation **21**
Findings 21
Recommendations to reduce visitor impacts 22
Recommendations to reduce employee impacts 24
Recommended Sustainability Management Process **26**
Steps in a SMS 26
Who does what 26
An action plan to move forward 27
Sustainability Metrics Framework **31**
Assumptions driving our choice of targets 31
Relationship to TNS system conditions 32
Advice about refining the metrics 34
Appendix A-Energy Audit Results **35**
Metro Regional Center 35
Convention Center 37
Expo 39
Keller Auditorium 41
New Theater 42
Schnitzer Theater 43
Appendix B-Water Audit Results **45**
Appendix C-Recommendations by Type **56**
Appendix D-Sustainability Metrics Framework **59**

Executive Summary

Background

Metro requested an environmental audit of four facilities: MRC, Expo, Oregon Convention Center and the Portland Center for the Performing Arts. The emphasis was to be placed on energy and water, but transportation was also to be considered. The audit results were to be used to identify opportunities for sustainability initiatives. However, an environmental audit is only a portion of the information needed to design sustainability initiatives. In order to provide a fuller context for sustainability, the consulting team has put the environmental audit data into perspective by providing a skeleton "sustainability management system" (SMS) with associated metrics and targets. This report summarizes our findings from the environmental audits and the development of a skeleton SMS.

The core members of our team were:

- Darcy Hitchcock, AXIS Performance Advisors, Inc. (project lead, SMS)
- Wayne Rifer, Rifer Environmental (SMS, eco-metrics)
- Dave Robison, Stellar Processes (energy audit)

The Technical Advisory Committee members were:

- Nathan Good, PGE (green building)
- Chris Helmers, Pacificorp (conservation)
- Mark Boyko, Bureau of Water Works (water conservation)

Mark Boyko conducted the water audit as part of BWW's normal customer service, coordinated with this project. For your convenience, their results are integrated into this report.

In the course of this project it was necessary to develop certain base assumptions in order to build metrics that can be used for evaluating future performance improvements. Specifically, a base case for comparison purposes was defined. The calendar year 2000 was selected as the base year since a full year's data was available. However, one problem with the base year is that a facility at the Expo Center is now in operation that was not in the base year. The new facility was included in the audit and should be included in the base case. Therefore some adjustments have been made in the base case to account for this new facility and the conservation measures we are recommending. This is referred to as the "projected case."

Definitions

Backcasting: A process of examining what your operations will need to be in a sustainable future and working backward from there to identify necessary actions to get there.

Benchmarking: A process for identifying best practices in an industry or function.

Carbon neutrality: Operating in such a way that results in no net increase of carbon dioxide and equivalent gases in the atmosphere.

Eco-efficiency: Saving energy, water or raw materials in an attempt to save money. Focus is on doing better, incremental improvement.

Plug loads: Energy attributable to electrical outlets in a building, usually office equipment, computers, etc.

Sustainability: Meeting our own needs without compromising the ability of future generations to meet theirs. Optimizing environment, economy and social equity. Focus is on doing enough to become sustainable.

Target: A quantitative goal. In our Sustainability Metrics Framework, the targets attempt to define a sustainable level of performance.

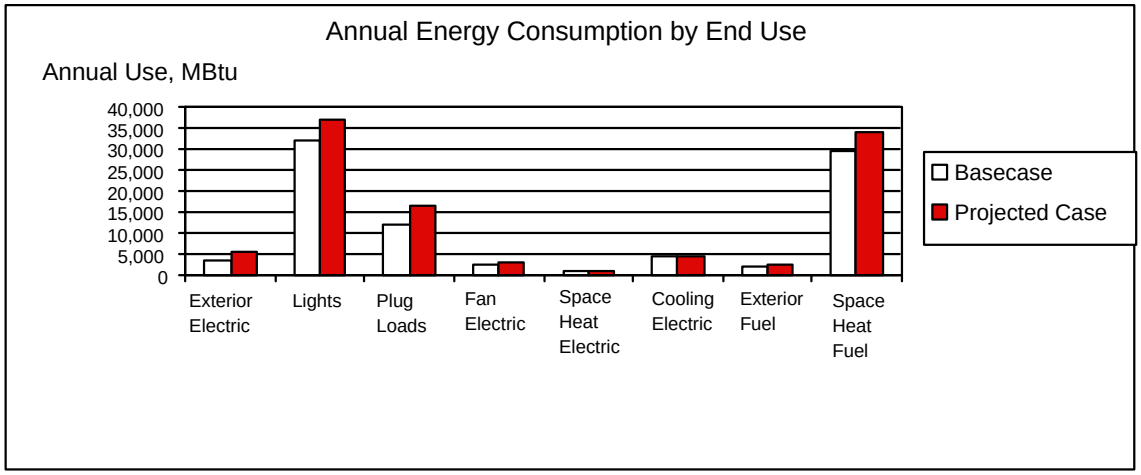
The Natural Step Framework: A science-based definition of a sustainable society.

Weather adjusted: An adjustment to the energy consumption data of a building to remove any impacts of unusual weather.

Major findings

Metro has done well in finding eco-efficiencies: Facilities people already have done a great job identifying opportunities for eco-efficiencies. The eco-efficiencies implemented, as the term implies, have resulted in both economic and ecological savings. In addition, they have some excellent ideas for things to work on next.

Lighting is the largest energy use. The chart below combines the energy uses for the four Metro facilities included in this study. The base case represents the calendar year 2000. The projected case adjusts those numbers to estimate the usage once the expansions at the Oregon Convention Center and Expo Center are completed and accounts for conservation measures already implemented and recommended in the Energy Savings Summary Chart. Charts for each individual facility can be found in Appendix A.



Here's the data charted above:

Energy End Use	Base case Annual MBtu	Projected Case Annual MBtu
Exterior Electric	3,682	5,354
Lights	31,626	36,768
Plug Loads	11,853	16,351
Fan Electric	2,483	3,065
Space Heat Electric	1,073	1,219
Cooling Electric	4,661	4,763
Exterior Fuel	2,195	2,360
Space Heat Fuel	29,405	33,580
TOTAL	89,978	103,406

Energy bills were about $690,000 for electric and $74,000 for gas. (Interestingly, the bulk of the gas charges occurred at Keller and Schnitzer. These sites appear to have a high service charge.) So 10% electric savings would be about $69,000. Of course, we expect electric prices to go up in the near future.

The focus has been on eco-efficiencies, not sustainability: While finding eco-efficiencies is a great first step, it will be insufficient to reach sustainability. More radical proposals will need to be entertained that affect your business systems, philosophy, etc. For example, The Center for Performing Arts absorbs the energy costs of all events. For practical reasons, energy conservation has not been an explicit part of the business relationship with event organizers. This just perpetuates the out-of-sight-out-of-mind externalization of costs that is partially to blame for our unsustainable society now. It may take time to phase in a change to these business systems that are apparently in common practice. The first step in this direction can be to provide data about energy use to event sponsors. Then, as it becomes practical to alter the business arrangements with event sponsors, the costs of additional energy, above a load expected by state-of-the-art fixtures producing an equivalent functionality, can be charged back to the sponsors. Ultimately, all lighting used in the facility should be required to meet Metro energy conservation standards.

Enlarge Your Focus of Responsibility

Sustainability ≠ Measure of Individual Enterprise

Sustainability ≈ Measure of Society's Enterprise

The focus has been internal and Metro has not yet used its influence systematically to affect others. These facilities have not, as of yet, used their relationship with Metro to influence others: their suppliers, customers, and the sector. It is certainly wise to get your house at least partially in order before you try to affect others behavior, but we recommend that you use your visibility and clout to begin doing that.

Visitor transportation is a major factor in Metro's environmental impacts: Visitor transportation is a major factor in your environmental impacts: Without much actual data about visitor transportation patterns, we have made some educated guesses for each event facility. We discovered that almost 40% of your greenhouse gas emissions may come from visitors driving to your events. So reducing that impact should be a significant focus of your sustainability efforts.

Need for more data: To put together a viable sustainability management system, there are additional data points you'll need to gather. It's difficult to normalize data based on visitor-days or events because the sites don't all track visitors by month, associated energy use by event, etc. For example, OCC should track the number of visitors monthly. Then they should track the number of cars parking monthly, with a conversion factor to people. This is probably all available data and is needed to: 1) normalize resource use 2) determine efficiency of getting people out of their cars. The Expo does not have monthly visitor numbers. The event organizers have traditionally kept that data, and, apparently, not provided it to Expo. They said that they will be getting it soon (some administrative change). A database should be constructed that tracks visitor usage for each event facility.

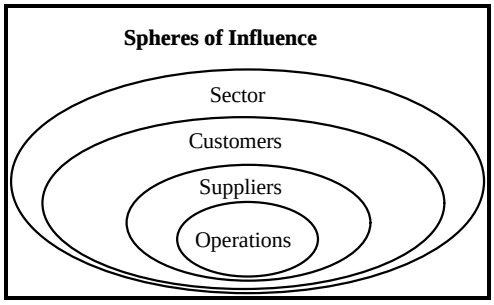
General recommendations

Evolve beyond just eco-efficiencies to a sustainability focus: Sustainability implies that Metro take responsibility not only for its own operation but also its impact on the environment and on society. Since Metro is using up a share of the earth's resources, how valuable is the service you provide? Are you making good use of those resources? Bring equity and the environment up to the same level of focus as economic factors. Use backcasting to envision Metro in a sustainable world. Measure your performance on all three dimensions.

Measures of Worth

- ✔ Economical
- ✔ Ecological
- ✔ Equitable

Begin influencing the behavior of others outside Metro: There are several spheres of influence: internal operations, suppliers, customers and your sector. While it is usually a good idea to begin "cleaning up your own house," Metro can quickly turn to influencing the behaviors of others. Metro should be willing to take some heat for some controversial actions, for doing the "right thing." Use your visibility to draw attention to sustainability as an issue. Educate events sponsors about choices they can make that are more sustainable. Make their impacts more visible to them (e.g., energy use). Educate visitors about sustainability with signs, brochures and actions, and influence your sector by beginning a benchmarking study of best practices and communicate the results. Metro must take a leadership role: take risks, experiment with new technologies, have demonstration projects, build visible examples of sustainable facilities, etc. If Metro won't, who will?



Benchmark Metro's enterprise: While backcasting helps you envision the future, benchmarking helps you figure out what you can do now. It also influences the thinking of others in your sector. While it is true that every event facility will be unique, there should still be important lessons and insights you can gain from one another. Initiate a benchmarking study, either on your own or through a trade association.

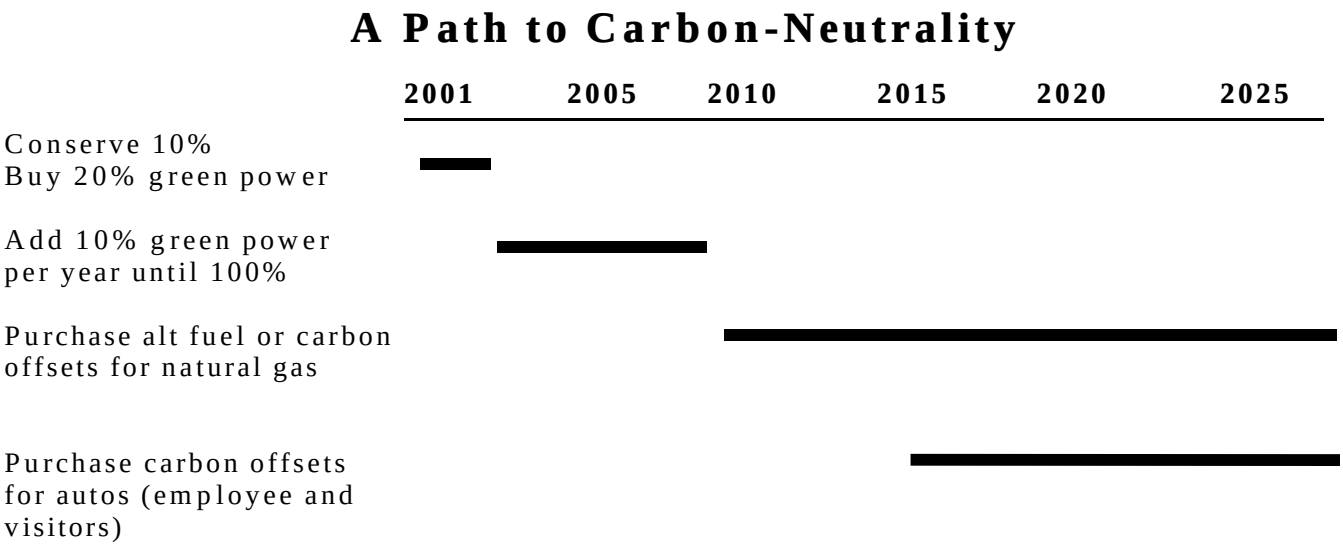
Benchmarking Steps

1. Build Sector Capability
2. Identify "Best Practice" Candidates
3. Define "Reference Values"
4. Conduct Benchmarking Studies
5. Achieve Best-In-Class

Set up a sustainability fund: While many sustainability initiatives will save money, some will cost money. People may be discouraged from doing the "right thing" if the idea doesn't pencil out. But Metro needs to look at its operation as a whole. Some things may save and some may cost money. Creating a sustainability fund can give Metro a way of managing these trades. When departments make choices that save energy, environmental impacts and money, credit that savings to a sustainability fund so that it can fund other sustainability efforts which may not have a positive or short-term pay-back. ENACT could manage this fund.

Paths to sustainable energy and water use

Become carbon neutral: From an environmental perspective, the primary reason to reduce energy use is to reduce greenhouse gases. But this is more a function of where your power comes from than your usage. For example, when you buy electricity from a coal-fired power plant, the plant emits carbon dioxide and other greenhouse gases. When carbon dioxide comes from fossil fuels, it increases the concentration of CO2 in the atmosphere since it came from the earth's crust. There are two main sources of carbon emissions: energy use in buildings and transportation, especially by visitors. You can change your operation over time to become "carbon neutral," so that you are not adding CO2 to the atmosphere. Please see the timeline, as follows:



We estimate that the eco-efficiency measures you've taken this year, along with others that we are recommending should be able to save Metro approximately 10% on your energy use. Plow that savings into purchasing green power and that will result in an immediate reduction of 30% (combining the two.) Then, every year thereafter, add 10% green power until you are buying 100% green power, by 2010. This makes your electricity carbon neutral. Then in 2010, address your natural gas use, either by purchasing alternative fuels (biogases) or carbon offsets. Beginning around 2015, begin purchasing carbon offsets to offset the remaining carbon impacts for transportation (employee, fleet and visitors). By then the auto emissions should be dramatically lower for two reasons:

- Our "Ticket to Ride" proposal should dramatically reduce the number of visitors who drive to your events. (See the Transportation section of this report.)
- We project that vehicles should be on average 50% more carbon-efficient, thanks to hybrids, hypercars, and other cleaner technologies already in the research and development phase.

Reduce water use by 50%: Regarding water, it is more difficult to know what the appropriate target is. According to Lorna Stickel, Project Manager for the Regional Water Providers Consortium, the Regional Water Supply Plan calls for conserving around 12% by 2025 for external water use and an additional reduction through "naturally occurring conservation" based on 1992 regulations for indoor plumbing (approx. another 12%). So at a minimum, Metro should shoot for a 25% reduction in water use. But these figures assume building more infrastructure such as building reservoirs at Bull Run and Hagg Lake or tapping into the Willamette or Columbia Rivers. Reservoirs in particular would seem to violate The Natural Step System Condition 3. I was not able to locate anyone who could pinpoint what the region would have to conserve to avoid developing new sources, but based on growth, some estimate we'd need to conserve at least 50%. This off-the-cuff estimate needs to be refined and should take into account the likely effects of global climate change which is forecasted to give us wetter winters but longer, drier summers (i.e., more need for irrigation and cooling). In addition, population is expected to increase by about 40% in that time period. So, in the absence of any better data, we've arbitrarily adopted the 50% conservation goal for the purposes of this report. Over the next few years, more study should be done to determine what a sustainable water conservation target should be.
So assuming that Metro over all should save 50% of your water use by 2025, here is our recommendation about how to get there. The best opportunity in your facilities is rain water catchment since you don't have a lot of gray water. The best facility for this application is the Expo Center for the following reasons:

- The peak usage for water is in the spring and fall, which correspond with high rain months.
- You are planning to construct a new building, so that provides an opportunity to build rainwater catchment into the plans, which is cheaper than retrofitting existing buildings.
- The average rain falling on your existing buildings exceeds your annual usage, so depending upon the size of your storage facilities, it's certainly possible to offset much of your water use.
- There is an existing well (non-potable) which can be used to top off storage tanks in low-rain months. (Check your water right on the well to see if it's necessary to change it to use the water for uses other than irrigation.)
- There is ample space for storage tanks.
- We estimate that 90% of the water use could be handled with non-potable water: irrigation, car washing, pressure washing, floor washing, and toilets.

If you replaced 90% of your water use, you could save approximately $10,800 per year at current water rates.

The second best opportunity is the Oregon Convention Center. There you could also use non-potable water for cooling tower make up. If you conserved 90% of the water at those two facilities, you would exceed the 50% water conservation goal.

Smaller projects can also be undertaken to get experience with the new technologies, educate the public and provide leadership. Initial projects should be selected based on a reasonable payback period. For example, installing waterless urinals and ultra-low flow toilets at MRC would save 500,000 gallons per year and provide a payback of less than four years. Annual savings would be almost $5,000, or $30,000 over the life of the toilets assuming a 10-year lifetime.

So here is how we would recommend phasing in a water conservation plan:

Path to Sustainable Water Use./

Phase 1	**Phase 2**	**Phase 3**
EXPO: Design your new building with a dual plumbing system so you can use the non-potable water in the toilets. Begin gathering water at some existing buildings for use in irrigation, car washing, pressure washing and floor cleaning. OCC: Design you new building with a dual plumbing system. While this is not built into your existing plan, there is still time to make the changes before the walls go up. Use the water for cooling tower, toilets and irrigation. MRC: Replace toilets and urinals with low-flow and waterless models.	EXPO: Retrofit interior plumbing for toilets during remodels or repairs. MRC: Put in rainwater catchment system for irrigation.	OCC: Retrofit interior plumbing for toilets during remodels or repairs.

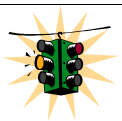
Top 3 recommendations

Here are our top three recommendations to focus on in the next year:

1. ENACT should refine the vision of sustainability for Metro and begin enrolling other key players to build support for top executive commitment to sustainability.
2. Work with Tri-Met to refine the "Ticket to Ride" concept.
3. At the MRC, modify HVAC controls to reduce the amount of electrical resistance heating and find daylighting controls that will work properly.

Legend for specific recommendations

In the report, we provide a host of specific ideas for ways to reduce energy and water use, as well as to move toward sustainability. To make it easier to assign priorities, we have assigned each idea a symbol using the following legend:

Symbol	Meaning
	Low hanging fruit; should provide quick bottom line savings.
	Worth looking into or gathering more data.
	Something to do right away. Either easy to do or necessary to do now to lay a foundation for the future.
	Just a random idea.
	Save for later. Contingent upon something else, usually emerging technology or building/remodeling plans.
	Green leadership: might not pencil out or save you a lot of money but Metro should do it anyway, to provide a demonstration project, educate, or otherwise support movement to a more sustainable region.

Common facility recommendations

The following recommendations apply to all or many of the facilities. We have placed all these recommendations here rather than duplicating them under each facility's section in the report.

Install Vending Miser (TM) on soda **vending machines**. Where vending lights are not needed for marketing (in employee lunchrooms, for example) the vending lights can be removed entirely.

Over time, move toward **waterless urinals** (now in use in Wilsonville) and **two-button toilets** (tank-type) or ultra-low-flow toilets, especially in high use restrooms. Be sure to investigate the effectiveness of the models and purchase ones that will not cause maintenance problems. Please note that the waterless urinals are not yet approved for use in this area.

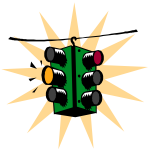
Develop a **long range plan** to become sustainable which takes into account long term plans for expansion, remodeling, demolition, operations.

Begin gathering **baseline data on visitor transportation** choices.

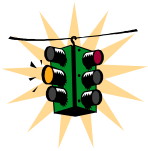
Institute a policy to exchange **CFC-using equipment** with HCFC models when on replacement.

Over time, change all your **landscaping** to a zero-irrigation or almost zero system. Irrigation systems leak, break, and require constant maintenance. They also often use more water than is necessary. Make your goal to end up with a landscape that only requires a little hand watering (or from a drip system) in late July or August. Using native plants, avoiding annuals, eliminating traditional turf, planting in the ground instead of in planters, and planting deciduous trees which shade areas during the summer can all reduce the need for irrigation. Give preference to plants which provide food, nectar or habitat for butterflies, birds and helpful insects.

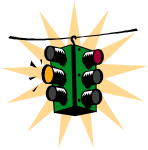
Show **energy usage associated with events** on their bills, preferably stated in terms of greenhouse gases. Develop a pamphlet which explains Metro's role in promoting sustainability and provides suggestions of things they can do to reduce their energy use. Where possible, evolve to a fee structure where events pay for their own energy use so that they aren't able to externalize that cost on you.



When purchasing **clothes dryers**, use gas models where it is possible to vent them properly.



Investigate using the **human waste to create methane** to power fuel cells once the technology matures.



Consider using infrared sensors on the **faucets** for any upgrades or remodels.

Energy savings summary

The following chart lists the recommended near-term conservation improvements, along with their associated estimated energy savings. We believe a 8-10% energy conservation goal for the next two years is reasonable. In this report, we also provide longer-term recommendations that can take you further.

Energy Conservation Measures	**Electric Savings, kWh/year**							**Gas Savings therm/ year**
	Convention Cntr	**Expo**	**Keller**	**MRC**	**Schnitzer**	**Theater**	**Total**	
Chiller water hookup					10,814	21,518	32,332	
Efficient office equipment				50,098			50,098	
Vending Miser, remove lights		7,500		7,500			15,000	
Move temperature sensor	44,136						44,136	
Dimmable lighting in theaters			460,648		150,436	269,981	881,065	
Re-enable daylighting				50,566			50,566	
Improve HVAC controls				200,013			200,013	
Decrease external lights (already done)				224,196			224,196	
Graywater heat exchanger								602
Sum of Savings							1,492,371	602
Consumption by Facility	8,027,912	2,299,581	3,287,023	2,289,015	1,180,966	1,961,777	18,514,743	325,870
Savings by Facility	44,136	7,500	460,212	532,373	159,647	288,503	1,492,371	602
% Saved	1%	0%	14%	23%	14%	15%	8%	nil

Metro Regional Center

Findings

This is an office facility with long operating hours. There is very little natural gas usage but a relatively large amount of electricity used for heating and cooling. In part, this is due to the mechanical design. The building operates with a single-duct system -- hot air is distributed for morning warm-up, then cool air for air conditioning during the rest of the day. If parts of the building need heating, electric resistance elements are used. The result is simultaneous heating and cooling, resulting in excessive energy use. A study of the building controls would likely find ways to improve on heating and cooling energy. Staff is working well within the control system's limitations to cool with night air and to minimize energy consumption. Properly designed external shading for the atrium could reduce solar gains in summer while maintaining the daylighting effect. Some equipment recently failed and was replaced, apparently without a policy regarding replacement of CFC refrigerants with HCFCs that are less harmful to the environment.

Lighting fixtures are efficient but usage is higher than expected because daylighting controls are not operating. There appears to be a policy to use efficient computers and office equipment, however more savings can be expected as new office equipment will be even more efficient. During the last few months, operations have already reduced electric usage, primarily by minimizing outside lighting. Staff is continuing to identify opportunities for further lighting reductions. Vending machines could be fitted with Vending Miser controls and, if vending lights are not necessary for marketing, they could be removed entirely.

Overall the Metro Regional Center (MRC) is water efficient. The age of the building indicates that the fixtures are low flow. The faucets are spring activated and have a flow rate of 1.5 gpm for 8 seconds. Showers in the basement level were measured in the 2.5-3 gpm flow rate. 2.5 gpm is considered to be low flow, but lower flow rate showerheads are available and have satisfactory performance.

The irrigation system is on controllers. Normal irrigating times are between 1:00 AM - 5:00 AM. MRC staff do all the maintenance on the irrigation system. Most of the landscaping is drought tolerant. In 2000 they experienced several leaks in the system. MRC staff indicated that the irrigation system was of poor quality. This indicates the potential for further leaks as the system ages.

Cooling is provided by roof mounted packaged units that are air-cooled. There is no single pass cooling. Metro is currently studying the feasibility of a rainwater system for irrigation and potentially toilet flushing.

Recommendations

Consider installing a **graywater heat exchanger** on showers. This would save about half of the hot water used for showers.

Continue to identify **lighting fixtures** that could be replaced with lower wattage fixtures in office building.

Develop a procurement policy for efficient **computers/office equipment** in MRC. Make default settings based on energy and resource efficiency (e.g., duplex printing, sleep modes, etc.).

The **irrigation system** should be sub-metered. This would allow for a sewer credit on the irrigation water. It would also alert staff to leaks in the system in a more timely manner.

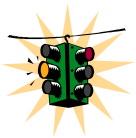
Replace the commercial **laundry washer** in the day care center with an energy and water efficient model, sizing the unit for the typical loads. Care should be taken to use the small load settings as appropriate.

Develop a way to successfully re-enable the **daylighting controls**. Get technical assistance to find a system that works.

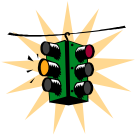
Study controls improvements to minimize electric re-heat of cooled air.

Investigate the use of Earth Tubes to bring in **passive cooling** (from underground) into the atrium area during the summer to offset the greenhouse effect.

Consider replacing the **glass in the atrium** with tinted PV glass. Choose glazing that would reduce the greenhouse effect you are getting in the summer without dramatically reducing your daylighting. The PV coating can provide some power for your facility and/or run ceiling fans to circulate the air. This is leading edge technology, just starting to become available in this country, currently available in Europe. Within a few years, one should be able to specify PV glass at about the same cost as other low-e glass. Both are prepared by a similar process (metal deposition in a vacuum chamber).



Investigate the amount of short **lunch trips and errands** that might be served with a small electric fleet vehicle such as a Sparrow. Then add electric charging stations at your parking garage (fueled by green power).



If green hydrogen fuel (i.e., hydrogen not from fossil fuels) becomes available for cars, set up a system where **fuel cell vehicles** (either fleet cars or employee-owned vehicles) can be plugged into the grid in your parking lot. They might provide enough power to run much of the MRC. This would maximize the use of the resource (rather than leaving engines idle for most of the day). We do not recommend this if fuel cells continue to be run off methane or natural gas since, from a greenhouse gas perspective, you'd be better off buying green power.

Build an external **sun screen for the atrium** which will reduce the summer greenhouse effect without appreciably affecting the daylighting. Metal framework placed over the atrium could be covered with translucent panels or screening which could be removed in the winter months.

Expo

Findings

This facility consists of a number of large, open buildings with moderate occupancy -- there is little occupancy in summer. The older structures lack air conditioning and have inefficient lights. A lighting retrofit is doubtful since these structures will be replaced in a few years. However, uncertainty as to when the replacement will happen interferes with settling on a definite plan. The new structures are well controlled and have generally efficient lighting. The anticipated replacement building would be similar to the newly constructed structures. Since construction has not started, there is time to ensure that the new design incorporates sustainability and efficiency features. Vending machines could be fitted with Vending Miser controls and, if vending lights are not necessary for marketing, they could be removed entirely.

Overall the Expo Center is water efficient. The new Halls (D & E) have ultra low flow toilets and faucets with less than 1 gpm flow rate. Halls A, B, and C have restrooms that have low flow toilets.

Almost all the landscaping at the Expo Center is done with drought tolerant and native plants. Some of these plants are on an irrigation system that is fed from a well on the property. The newer landscaping does not have an irrigation system and is done manually. The soil is almost all sand but the landscaping is mulched. The water consumption history does not indicate excessive irrigation.

Cooling is provided by roof mounted packaged units that are air-cooled. There is no single pass cooling.

Recommendations

Along with beginning a **rainwater catchment system** (at least for exterior use such as irrigation and car washing), provide the grounds keepers a water tank that will fit in the back of a pickup (preferably an alternative fuel vehicle). This will enable them to water the plants without dragging hoses long distances. This tank can be filled with the non-potable water system.

Ask Tri-Met to install an **automatic people-counter** at the Max stop to make it easier to judge the effectiveness of the Ticket to Ride program (see Transportation).

Set a firm date for **deconstructing the old facilities.** The uncertainty makes it difficult to know whether to retrofit lighting, etc. So set a date and then establish plans for either deconstruction or upgrading, based on the associated costs. When the time comes to demolish the building, use Deconstruction Services or deconstruct the building yourself and sell the materials.

Drive **exhibitors** to be more conscientious about waste through education, incentives and consequences.

When the **replacement facility** is built, it should go through a sustainable design process to ensure that all possible features have been considered. Features to consider include:

- Orienting the building so that the majority of the windows are south-facing.
- Using PV-glazing on the south-facing glass to generate power.
- Provide more daylighting with motorized shades so you can darken the area when needed.
- Provide a sorting area for convention-related waste (cardboard, metal strapping, etc.).
- Provide a dual plumbing system that can use rainwater and well water in toilets. Expand the rainwater catchment system.

The **existing well** should be considered when designing any facility expansions. It may be possible to use the well water in a dual water system: potable and non-potable. The non-potable well water could be used for toilet flushing.

Any **new landscaping** around an expansion should have a drip irrigation system linked to a non-potable source if possible.

Portland Center for the Performing Arts

Findings

There are three large buildings: Keller Auditorium, New Theater and Schnitzer Theater. All facilities operate with a variable schedule depending on the types of events. In general, these facilities have a large amount of house lighting that requires capability for continuous dimming. To date, efficient lighting fixtures have not been identified that will provide this capability. We anticipate, however, that new lighting products will soon be available that will combine efficiency with dimming capability. The Schnitzer Theater, in particular, has to maintain carefully controlled temperatures for the orchestra. This building often has with small cooling loads that must be served by a large cooling system. The result is a system that operates inefficiently. The chilled water systems of the two theaters could be linked and served by a cooling plant that designed to serve smaller loads. This would result in an efficiency savings for both theaters but will require further engineering study to develop. Hot water service to restrooms could be eliminated but natural gas savings would be small.

Overall the Performing Arts Center (PAC) is water efficient. Most of the toilets in the facility are low flow. Five ultra low flow toilets are located in the office area. The faucets in the public restrooms are 1 gpm. There is no irrigation at this facility. Facility cooling is provided by chillers and a cooling tower. The cooling tower operates all year. A small chiller will eventually be added. The cooling tower will be sub-metered to get a sewer credit for evaporation. The cooling tower's fans have two speeds. The Backstage Café is a restaurant that operates part time, mainly on the weekends. It serves about 6,500 meals per year.

The Arlene Schnitzer Concert Hall can be made more water efficient. Toilets are low flow. Faucets have a 2-2.5 gpm flow rate. They appeared to provide a good spread, so it may be possible to lower the flow rate by reducing the pressure. There is no irrigation at this facility. Facility cooling is provided by chillers and a cooling tower. The cooling tower is operated most of the year. A small chiller will eventually be added. The cooling tower will be sub-metered to get a sewer credit for evaporation. The cooling tower's fans have two speeds. Don Scorby indicated that the PAC has enough cooling capability to provide most of the Concert Halls cooling. To do this the chilled water systems would have to be linked. The display case coolers in the lobby have single pass cooling. They run all the time.

Overall the Keller Auditorium is water efficient. Toilets are low flow. Faucets have a 2 gpm flow rate. There is no irrigation at this facility. Facility cooling is provided by chillers and a cooling tower. The cooling tower is operated most of the year. A small chiller will eventually be added. The cooling tower will be sub-metered to get a sewer credit for evaporation. The cooling tower fans have variable frequency drives.

Recommendations

The **PAC cooling tower** should be sub-metered. This will allow for a sewer credit and give the ability to monitor cooling tower performance.

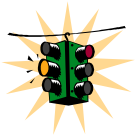
Try lowering the **faucet flow rates** at the Schnitzer to an acceptable level by reducing the pressure. Try lowering the faucet flow rate to 1 gpm at the Keller.

Study **linking chilled water systems** between the Performing Arts Center and Schnitzer to permit more efficient operation under low-load conditions, saving quite a bit of energy and some water.

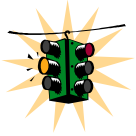
Continue searching for appropriately dimmable fixtures for **house lights.**

Collect more data on the flow rates through the **display case coolers** at the Schnitzer. This will help determine the cost effectiveness of converting to an air-cooled system, connecting to the chilled water loop, or changing operations.

Since **lighting** is the primary energy user and many events bring in their own lighting equipment, implement lighting efficiency standards for all events. Begin by explaining your lighting preferences and over time, work toward a system of surcharges. Work with your industry sector to promote energy efficiency standards as common practice.



If power supplies become inconsistent and you end up running your **generators** quite a bit more, investigate changing the fuel supply (fuel injectors). Diesel engines can be converted to burn mostly natural gas with just a little diesel. It's both less costly for fuel and produces fewer emissions.



As needed, continue changing out **toilets** to two-button or pressure-assisted models.

In the Schnitzer, put a demand valve that visitors can use on **water fountains.** If a fountain is still desired for aesthetics, put one in that recirculates water.

Begin using ultra low sulfur **diesel** or biodiesel in the generators.

Oregon Convention Center

Findings

This is a very large facility with a high occupancy level. Staff are adept at programming the facility for specific events and lighting is efficient. Previous analysis identified a poorly placed temperature sensor that contributes to inefficient cooling operations. An expansion is currently underway. The new expansion is anticipated to include energy conservation measures but details are not confirmed.

Overall, the Oregon Convention Center is a water efficient facility. Due to the age of the facility the toilets are either low flow (3.5 gallons per flush) or ultra-low flow (1.6 gallons per flush). The faucets are spring activated and shut off automatically. The measured faucet flow rate was 1 gallon per minute (gpm) and lasted for 15 seconds. The new expansion will have infrared sensors on the faucets, toilets, and urinals.

There is not much of an irrigated area. A sub-meter on the irrigation system exists but has never been read. Reading the meter would give a good idea of the efficiency of the irrigation schedule of the controllers.

The cooling system consists of four cooling towers, three 800 ton chillers and one 250 ton chiller. The small cooling tower is run all the time to provide the minimum cooling. The other cooling towers cycle on depending on the demand of the chillers. Variable frequency drives (VFD) are being retrofitted to two cooling towers. This will result is a water and energy savings. The blowdown on the cooling towers is controlled automatically by conductivity sensors. Based upon the reported make-up and blowdown volumes, the cooling towers are being operated at about 10 cycles of concentration that is considered to be very efficient. The cooling towers use about 1,000,000 gallons of water annually for make-up. There is no single pass cooling in the facility.

Recommendations

Move the poorly located **temperature sensor** to improve cooling system operation.

Reevaluate the design of the **expansion** to maximize the number of sustainable/green technologies you can incorporate. In particular, plan for a rain water in most non-potable uses. Also provide adequate bioswales to handle parking lot run-off.

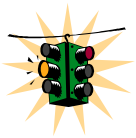
Start reporting the **irrigation sub-meter readings** for a sewer credit. (Sewer bills are based on water meter readings, not actual sewer discharges. You can get credits for water you buy but which doesn't end up in the sewer system through evaporative cooling and irrigation.) This has the potential to save $1,000 - $3000 annually. This will also alert staff when there are leaks in the irrigation system.

There is a small **leak in the irrigation** service to the median on NE Holladay. This is about 2,000 gallons per month, or about 0.046 gallons/minute. Although this is not a lot of water it may

indicate a weak joint or small crack that could develop into a larger leak. For that reason the leak should be fixed.

If possible, adjust the **spring-activated faucets** for about 5-10 seconds.

Consider building a **living machine** to process some of your waste as a demonstration project. A living machine uses plants and organisms to treat your waste water on site.

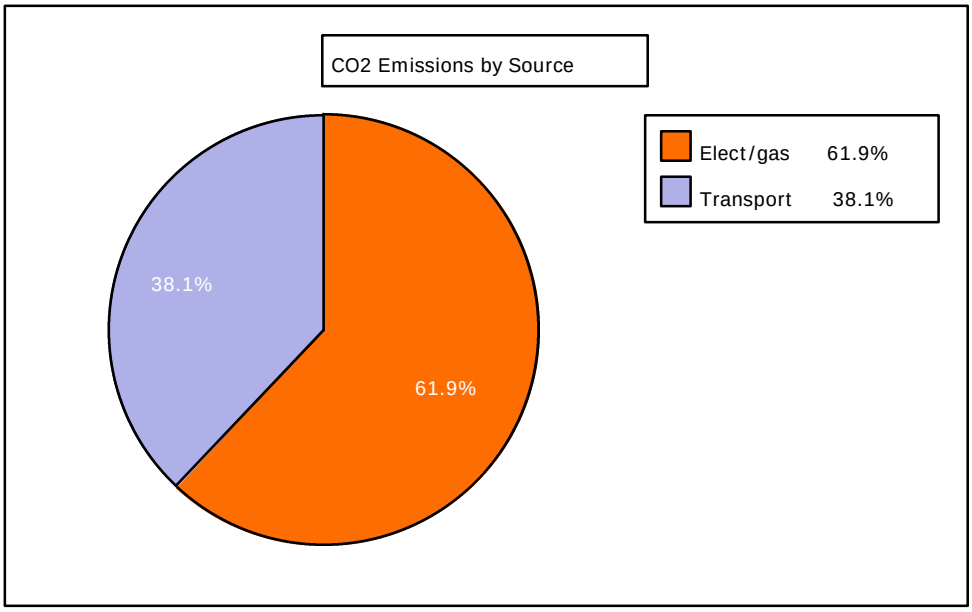


When the **glass in the spires** needs to be replaced, consider using PV glazing to generate electricity and reduce the greenhouse effect.

Transportation

Findings

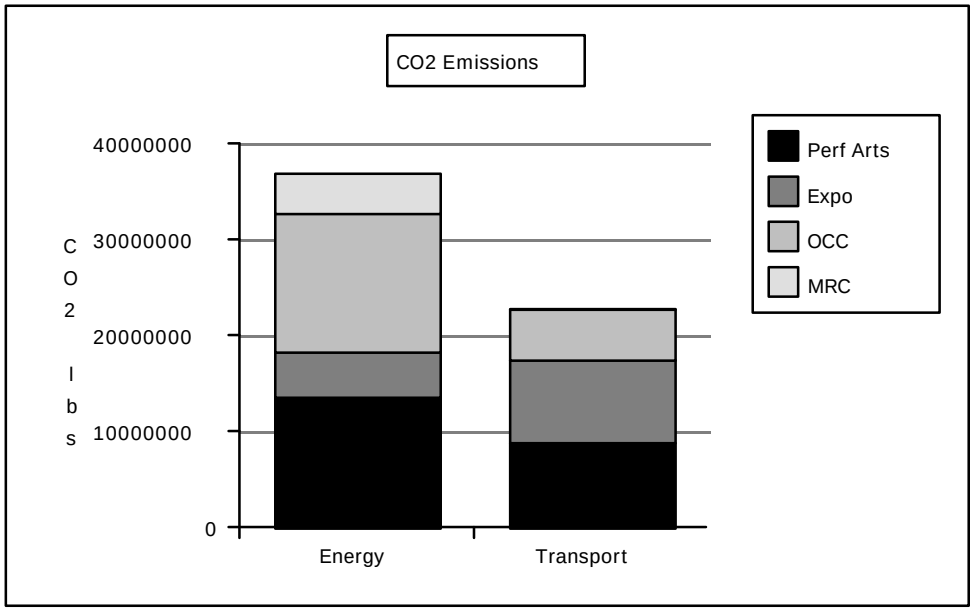
Visitor transportation represents close to 40% of your greenhouse gas emissions, whereas employee commuting is minor in comparison.



Please note that this is just a thumbnail estimate of CO2 emissions in regard to transportation. We only counted car emissions, not the emissions associated with public transportation, and the numbers for visitors are just best guesses (with the exception of the number of visitors per year). For the event facilities we did not include transportation for employees since the visitors would far outweigh their impact. Transportation by employees to the MRC was so negligible as to not show up on the charts, however we did not have data on business travel (e.g., by air). But the pie chart does give a sense of the relative impact that transportation and building operation have on climate change. The table below shows our assumptions. At current rates, it would cost you approximately $51,000 in carbon credits to offset all of this impact (at $5 per metric ton).

Facility	People	Percent driving	Number per car	Avg miles round-trip	Miles per gallon	Gallons gas	CO2 (lbs)
Perf Arts visitors	1,000,000	0.66	2	20	20	330,000	8,847,300
Expo visitors	650,000	0.99	2	20	20	321,750	8,626,117
OCC visitors	880,829	0.45	2	20	20	198,186	5,313,380
MRC employees	300	0.49	1	15	20	110	2,955

The following chart shows the impact by facility.



Recommendations to reduce visitor impacts

At the MRC, provide bus tickets instead of **parking validation**. Instead of rewarding drivers by validating their parking, use the money instead to buy a set of Tri-Met tickets. Give them to people who walk, bike or use mass transportation to come to the MRC.

Set up a **"Ticket to Ride"** system of ticket sales so that event tickets are valid on Tri-Met. There are two ways this might work: a fee built into the ticket price or a feebate-type system where increases in parking fees pay for the transit riders. Tri-Met does the former for selected events now (e.g., the PGE park). Setting up a standard system where all tickets qualify would perhaps make it easier to administer, increase Tri-Met revenues, and increase the likelihood that Portland residents would become accustomed to this arrangement and ride more often. For the sake of argument, let's assume that Tri-Met could give a 50% discount off their $2.20 round trip (2 zone) price (since not all ticket purchasers would use the transit pass) and that Tri-Met was willing to make the Ticket to Ride program work in all zones (so that we didn't have to differentiate where riders originate). The first option seems more feasible to us.

Option 1: Add $1.10 to all ticket sales. The tickets then become valid on Tri-met for the time of the event plus a couple hours before and after (or in the case of their arrangement with PGE Park, they are valid all day). Ticket sales can be aggregated from TicketMaster, Fastixx, and box office sales. On a quarterly basis, send Tri-Met payment for these fees. Periodically, you would need to renegotiate the Tri-Met fee based on actual ridership. At the Expo, an automatic counting system could be set up. For the downtown facilities, Tri-Met currently does periodic rider surveys to determine usage. This type of survey could serve as the basis for estimating ridership, at least until an automated ticket counting system could be developed. The Expo and OCC may be able to get rough counts by comparing their attendance to parking lot receipts.

The advantage of this system is that it is cheaper for the riders than purchasing a round-trip ticket and encourages ridership. It is also self-funding. The downside is that people who already have Tri-met passes don't benefit. It raises ticket prices which might impact the accessibility of the events to low-income people (although it might be possible to waive the fee for low-income individuals). It also doesn't discourage driving and involves gaining the cooperation of TicketMaster, Fastixx and related outlets.

Option 2: Increase event parking fees and use that money to pay for the Tri-met passes. The advantage of this approach is that it is both carrot and stick. The downside is that, in the case of The Center for Performing Arts, you would need cooperation from parking garages/lots and if you guessed wrong about ridership versus drivers, you may not get enough income to reimburse Tri-Met for riders.

NOTE: We passed this idea by people at Tri-Met to get their reaction and help in designing the proposal, making it clear that this was just in the idea stage. They were enthusiastic. If you want to take this idea further, please contact Tom Strader at 503 962-6424.

Similarly, develop a **feebate system** for out-of-town visitors to conference events at the Oregon Convention Center. Build into the Convention Center's parking fees money to offset providing out-of-town visitors Tri-Met passes for the days of the event (plus a travel day at either end). Alternatively, you could build this cost into the events fee. This would discourage out-of-town visitors from renting cars at the airport since the airport Max is soon to open.

In the same vein, find opportunities to reward people who ride bikes or walk to certain events such as those on the Waterfront.

Develop a system for TicketMaster and Fastixx to hook up potential **carpoolers**.

Recommendations to reduce employee impacts

Investigate subsidizing employee membership in CarSharing. Businesses can join on behalf of their employees to give them access to a low-cost car to use on company business. Metro may also want to underwrite all or part of the security deposit and membership fee for personal memberships in order to provide a valuable "perk" to employees so they can take the bus, bike or walk to work and still have a car for personal trips during the day. If you work in the Lloyd District and commute by transit, carpool/vanpool, bike or walking, you can already take advantage of special membership incentives under a program sponsored by the Lloyd District Transportation Management Association. See <http://www.carsharing-pdx.com/>.

Replace gasoline cars in fleet with **hybrid/hypercar** vehicles as you retire them.

Convert any **larger vehicles** to natural gas; convert to fuel cells or other cleaner technologies as these come on the market.

Reimburse people who take mass transit to **meetings at MRC** and other Metro facilities and provide an equivalent-value coupon (eg. free parking ticket next time they drive, a mass transit ticket, coupon at bike shop) to people that walk or bike.

Data collection framework for facilities

To get better data about visitor transportation habits, the facilities should begin gathering the following types of data.

- Number of visitors/month
- Parking/month

The following is probably best gathered with a periodic visitor survey:

- Distance
- Mode of travel
- Associated CO2 emissions

See the Sample Visitor Survey which could be conducted by sampling people as they entered the lobby of your events facilities. This same format could be used at the MRC in meetings.

Sample Visitor Survey

We are trying to gather information about visitor transportation choices. Please answer the following questions.

Distance

___ How many miles did you travel to this event (round trip)

Mode of transportation

❈ Bike or walk

❈ Mass transit

❈ Personal auto; ___ number riding with you; ___ avg. MPG of vehicle

Are you aware of our Ticket-to-Ride program? (See description below.)

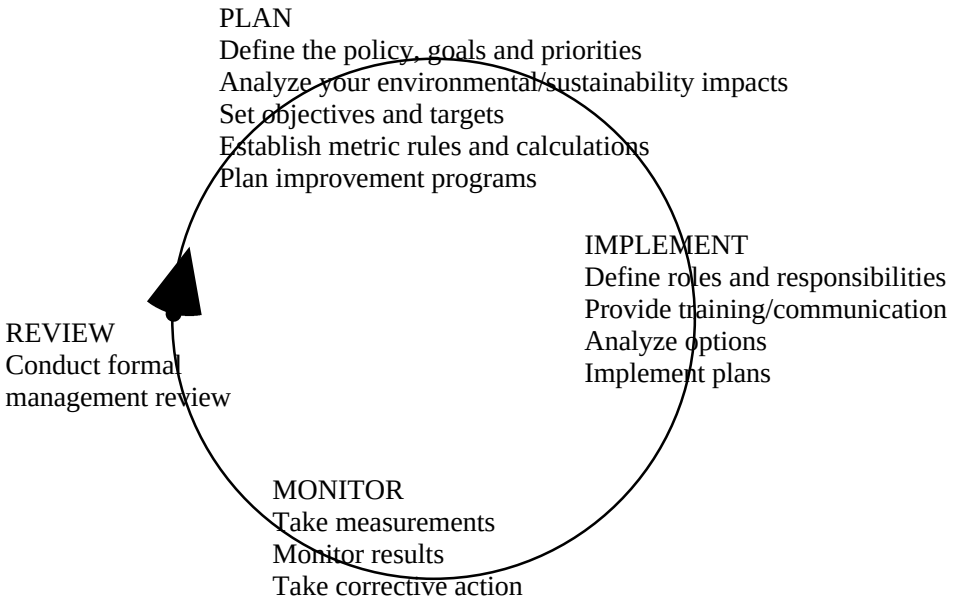
❈ Yes. Did you take advantage of it? (Y/ N) Why or why not? _____

❈ No. Now that you know about it, will you take advantage of it next time? (Y/ N)
Why or why not)? _____

Recommended Sustainability Management Process

Steps in a SMS

A key component of any sustainability program is a sustainability management system (SMS). Similar to an environmental management system (EMS), a SMS provides a way to systematically review your sustainability-related impacts, set goals, take actions, evaluate results and then begin the process again. It is based on the Deming cycle from Total Quality Management: Plan-Do-Check-Act.



An SMS differs from an EMS mostly in that it sets targets based on backcasting, an analysis of what your organization will need to do to be sustainable. Targets go beyond just eco-efficiencies (getting better) to sustainable goals (doing enough). It also involves ensuring that you are providing services at the lowest environmental impact, using benchmarking. In that an SMS encourages organizations to contemplate the limited supply of natural resources available to meet human and non-human needs, it often prompts organizations to question the value of the products and services they provide to society.

Who does what

We believe that it is more effective to integrate your SMS into your existing planning/goal setting and review systems rather than keeping it separate. The following chart explains how we recommend you perform the tasks associated with a SMS so that they become part of your long-range and operational planning cycles. As long as your sustainability efforts are only focused on your internal operations (as opposed to your policy-level functions for the region), this planning process can be integrated into your annual, operational planning process. (See diagram below). When your efforts extend to the larger policy-making efforts (e.g., the urban growth boundary, etc.), you will want to also integrate this with your long range plans (e.g., 2040, etc.)

The following table explains our recommendation of how this SMS process be performed each year.

SMS Steps	Who	When
Plan	ENACT does the analysis and develops recommendations.	July
	The Executive office and MERC review the recommendations.	Oct/Nov
	The recommendations then are approved by Council.	Feb-May
Implement	Based on the nature of the improvement programs, they'll be referred to departments, facilities or cross-functional task forces to implement.	Mar-July
Monitor	Monitoring will be a joint responsibility of those implementing the improvement projects and ENACT.	July-June
	ENACT will do a formal progress review at 6 months.	Dec/Jan
Review	ENACT will present a formal report management (currently the COO).	June

An action plan to move forward

Metro should undertake an initial set of actions to build the Metro SMS. The SMS will require an initial investment of staff time and resources to develop. Following the initial investment its implementation and continuous improvement should be integrated into ongoing and periodic activities so that it does not require significant resources beyond those normally budgeted.

This section defines a set of planning activities that serve as the initial phase of the Plan–Do–Check–Act cycle. These planning activities are based on the ISO 14001 Standard for an Environmental Management System (EMS)[1]. They are modified to provide a model for a Sustainability Management System.

The Action Plan is in two phases. The first phase should be begun immediately by ENACT and will build the ground for all future action. The second phase should be started when a basis of understanding and support has been built in the organization regarding the challenges and opportunities of sustainability.

[1] International Organization for Standardization (ISO) standards are available from the American National Standards Institute (ANSI) 11 West 42nd St., New York, New York 10036 (212/642-4900).

Phase I: Develop a clear vision and understanding within the organization of how to provide the public value and services that Metro provides within the constraints of a sustainable society – FY 2001-2002

The purpose of Phase I is to define and articulate the sustainability challenges and opportunities facing Metro as it currently exists through a multi-step process that engages major parts of the Metro organization. This process should be begun and led by ENACT. ENACT should first define a set of procedures and considerations that each (or a selected set of) department or function should take into consideration. The team should then work to implement the process with individuals in those departments who can become champions of the sustainability initiative. This process could include the following chief activities.

Step 1: Continue the analysis of Metro's environmental/sustainability impacts:

a. Extend the analysis of Metro's impacts beyond the focus of this project on energy, water and transportation to include the other pockets of the Sustainability Metrics Framework, addressing all departments and functions.

b. Define Metro's impacts in terms of local, regional and global changes in the state of ecological, economic and social conditions following the process described in ISO 14001 and using The Natural Step System Conditions as a framework.

Step 2: Employ backcasting as a tool to better understand the sustainability challenges, and to envision a more sustainable way of providing the services and values in the future:

Undertake a backcasting group project in each major department or function to define the "target zone" that Metro's impacts must fall within in a sustainable society. This project should be a group envisioning exercise facilitated by an ENACT team member and led by a member of the department. (See the following section for further explanation of backcasting.)

Step 3: Set sustainability objectives and targets for each impact area:

With the outcomes of backcasting in mind, define specific and quantifiable targets for each impact area that lie well along the path toward sustainability. The targets defined in this study should also be reviewed and revised if necessary.

Step 4: Develop a clear business case for Metro's pursuing sustainability:

Consider the threats and opportunities that Metro faces internally but also consider these same issues for the region. Develop compelling answers to these questions:

- Why is it in Metro's best interest to pursue sustainability?
- What are the risks and costs of not pursuing sustainability?
- What role should Metro play in the region to contribute to sustainability?
- What does that imply Metro should do both internally and externally?

Step 5: Build the policy framework and commitments at the top levels and throughout the organization:

a. Commit to achieving sustainability at the top level of the organization.
b. Adopt sustainability goals and priorities.
c. Commit to integrating sustainability metrics and an SMS into operations including into the ongoing and periodic planning and budgeting cycles.
d. Commit to extending Metro's responsibility for its products and services beyond its own operations to include the entire life cycle chain of suppliers and customers (Extended Producer Responsibility).
e. Commit to working with the national and convention, visitor and event industry to incorporate sustainability metrics and performance improvement efforts as an integral part of doing business.

Phase II: Implement the system elements of an SMS throughout the Metro organization – FY 2003-2004

Step 1: Develop a metric system to track performance toward achieving the objectives and targets:

a. Define a specific metric or set of metrics for each impact area. A metric is a specific measurement that can be taken periodically, and for which data can be stored in an information system, and that is normalized to some basic unit of activity, such as number of visitors or number of operational days, for comparison over time and through changing operational conditions. (See the section on Sustainability Metrics Framework for principles to use in defining operational metrics.)

b. Build the metric decision rules that define:

- The data required for each metric, and how they are to be collected and processed.
- The boundary conditions for each metric and data set.
- Normalization factors and how those data are obtained.
- The methods of storing, reporting and displaying the metrics.

c. Begin the process of collecting data and continuously improving the metric system.

Step 2: Design improvement programs for each aspect of operations that has an important impact using benchmarking as a tool:

a. Undertake a benchmarking project to identify current best practices and to begin the process of engaging others in the sector in defining benchmarks, standards and practices for sustainability. (See the following section for further explanation of benchmarking.)

b. Develop and implement improvement programs in priority areas of Metro's services.

Backcasting Project

The purpose of a backcasting project is to define, as specifically as possible at this time, the constraints that will be imposed on Metro's operations in a future world characterized by increasing constraints. The constraints on Metro must be considered within the context of the total human economy and society. Metro should then define a sustainable level of impact, or a "target zone," for the services that Metro provides.

Backcasting will also help Metro to refine the definition of the products and services and to envision the process of providing those services within a society that lives sustainably within its ecological/economic/social means. With this vision defined, Metro can better find its way to sustainability.

There are several specific outcomes of a backcasting project:

- A better definition and common understanding of what Metro's services are and the value to society they provide within an environmentally constrained world.
- The "target zone" of impacts within which the provision of those services must fall in order to be consistent with the overall constraints of a sustainable society.
- An initial assessment of the kind of improvement options that Metro will need to implement on its path to sustainability.

The process steps to be followed in backcasting are defined in materials available from the Oregon Natural Step Network. The process can be summarized in three simple steps:

1. Define in specific terms the services and values that Metro provides to the public through its various activities.
2. Identify the constraints that will be imposed upon the provision of those services and values in the future, and envision a sustainable way of providing them, possibly by a wholly different set of activities.
3. Identify specific ways that the current methods of providing those services is inconsistent with sustainable methods and identify what changes will need to be made.

Benchmarking Project

Benchmarking is a strategic process of comparing a specific aspect of your operation, such energy efficiency in lighting or carbon efficiency in transportation, with others performing similar functions, and specifically, with the best-in-class. Benchmarking is not a tool to specifically define sustainability, because it addresses current best practice, not sustainable practice. However, benchmarking is a valuable step on the path to sustainability for two reasons:

- It identifies ideas and opportunities for improvement that may not otherwise have been considered.
- It engages others in the industry and can be used to begin to establish higher standards of practice industry-wide.

Benchmarking is not a shotgun process of visiting and auditing the environmental programs of other facilities. Rather it is carefully planned and focused research project to gather information from selected facilities about specific operational practices. It is recommended that Metro undertake benchmarking on key aspects of its entertainment and trade show services, share the findings broadly within the industry, and promote industry-wide adoption of improved practices through industry associations. Be willing to look outside your own sector as well, to other industries that may provide similar functions or services.

A nine-step process for benchmarking is outlined by the Global Environmental Management Initiative (GEMI), an organization of a number of leading companies dedicated to fostering environmental excellence.[2] Metro should look to the GEMI work and others to define a benchmarking process that will meet its needs.

[2] " Benchmarking: the Primer, Benchmarking for Continuous Environmental Improvement", GEMI, 2000 L. Street, Suite 710, Washington, DC 20036, (202/296-7449), 1994.

Sustainability Metrics Framework

In this section, we provide Metro with a skeleton framework for sustainability impacts, metrics and suggested targets for 2025. This should be considered a beginning point and a working document, not a finished product. For some sustainability issues, we did not have enough information (or enough is not yet known) to set a target. See the complete set of metrics in the Appendix.

Assumptions driving our choice of targets

Many of our targets may seem absolute: zero waste, carbon neutral, etc. There are valid arguments that it may not be possible or necessary to go quite as far. However, we believe it is more useful to set these tough standards for the following reasons:

Face validity: For the average person, these absolute targets will make sense. Explaining the finessing of the numbers will be more confusing than helpful. Some argue, for example, that we will never be able to reach zero waste to landfills because the laws of thermodynamics imply that the usefulness of both energy and matter degrade over time (entropy). Eventually there may be material that is no longer useful to either the technical (human) cycles or natural cycles. However, following this logic just leads to more questions, not answers. Scientists simply don't know enough yet to determine what is a sustainable rate. We are more interested in making this tool simple and easy to understand, ensuring that the vector of your decisions is in the right direction rather than worrying that the target is exactly right. Over the next 24 years, you can refine the targets based on what our society learns over time.

Stretch goals: While you may not actually achieve 100% zero waste or carbon neutrality, if you set such a goal, you are more likely to get closer than if you set a 50% reduction goal. These absolutes will drive you to think more creatively, to invent radical innovations, rather than rely solely on incremental gains.

Practicality: The Natural Step system conditions repeatedly refer to "systematically increasing" the concentrations of certain materials. This implies that we can, in fact, extract materials from the earth's crust, for example, but that the degree to which these materials become available to nature, they must be redeposited at the same rate. This would imply that you do not need to have an absolute, 100% recycled content in metals. However, the rate at which materials are reabsorbed or redeposited is in most cases so slow that you may as well assume you can't extract any more. At this point, setting a goal of 99% recycled content versus 100% recycled content will not materially change your actions.

Precautionary principle: Similarly, some scientists estimate that we will have to reduce our emissions of greenhouse gases by 60% from a 1990 baseline[3] (rather than be carbon neutral as we have suggested.) Yet others state, "Stabilizing the atmospheric concentration [of CO2] at any level of possible interest -- even at a quadrupling of the pre-industrial level--would require that global emissions drop eventually to a small fraction of the current 6 billion tons of contained carbon (GtC) per year."[4] Since it is likely that the natural systems which can sequester carbon and related greenhouse gases will be further degraded by 2025 and because it is possible, through carbon offsets, to be carbon neutral now, we believe it is prudent to shoot for a carbon neutral goal. We may survive with a something less than carbon neutrality but nature will not be harmed if reach that goal. With the increase use of wind and other renewable energy sources and emerging technologies like hydrogen fuel cells, we believe that becoming carbon neutral and meeting many of these other absolutes will also be cost-effective.

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3 The Heat is On, Gelbspan, pg. 176

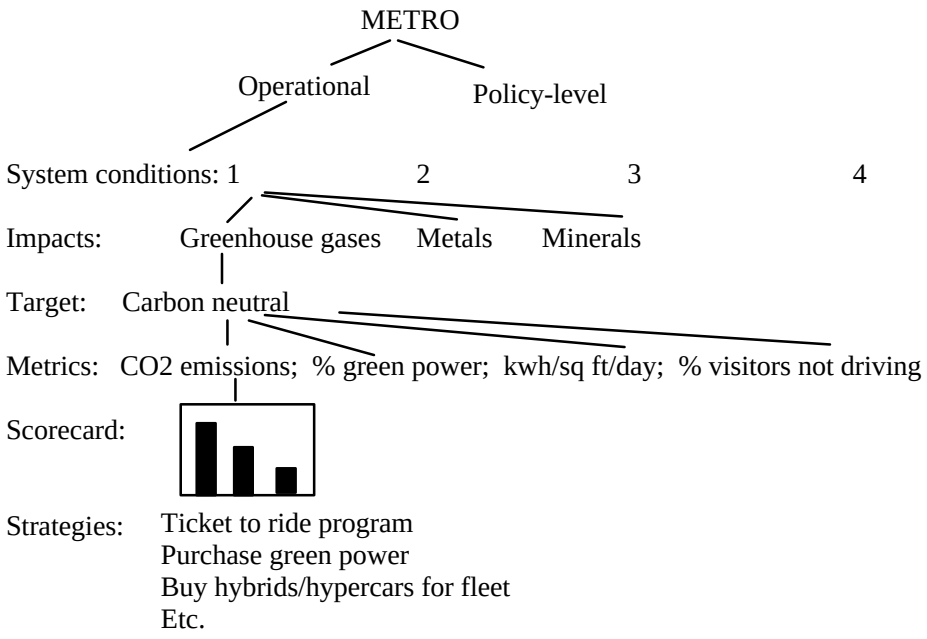
4 "The Energy-Climate Challenge" Environment Magazine, June 2001.

While we have set tough standards for your operations, we have also let you off the hook in other ways. While this set of metrics gives you responsibility for your own operations, we have not made you responsible for the "embodied energy" and other impacts in the materials you purchase. For example, when you purchase a car, concrete, or a copier, there is a certain amount of embodied energy and other environmental impacts that went into the creation of those products. We have captured some of these impacts under other goals (e.g., the target of 100% natural resources taken from sustainable sources). We are operating under the assumption that your vendors will also be moving toward sustainability and will be taking responsibility for their own impacts. So, for example, we have not included embodied energy of your purchases into the carbon neutral goal. To do so would significantly complicate the model. It is possible that, by 2025, all organizations will be required to achieve zero waste to landfill and carbon neutrality goals so will be taking care of this for you.

Relationship to TNS system conditions

The following is a high-level view of the targets and metrics, showing how they relate to The Natural Step system conditions. Please see the Appendix for a complete listing.

Structure of the Sustainability Metrics Framework



The framework uses the Natural Step system conditions as a way of organizing your targets, metrics and strategies. The framework provides "pockets" for metrics for your own operations. In the future, as you expand your sustainability efforts to your policy-level role for the region, you can use the same framework to add those metrics as well. When you do this, you will have a complete set of sustainability performance metrics and everyone inside Metro should be able to see how they contribute. This will help your diverse set of services find a shared mission.

For each system condition, there are a set of human impacts and a target that would be sustainable for each. The targets then imply eco-metrics and sub-metrics you might want to measure and each of those translates to a graph. Then you develop strategies to improve your performance against those metrics.

The following chart shows the impacts and targets for each system condition.

SC #1: Crust

Greenhouse gases
Carbon neutral

Metals
100% recycled content
100% recycled at end of life

Minerals
Š Redeposit rate

SC #2: Manmade

Toxics
Zero use PBT's
Zero emissions to nature of other toxics
% reduction of toxics

Waste
Zero waste to landfill
Compostables Š decomposition rate

SC #3: Habitat

Pollution
Eutrophication
Acid rain
Ozone

Over-harvesting
100% natural resources from sustainable sources
Water use Š rainfall or recharge

Displacement
Developed land Š 90% carrying capacity
Species extinction
Restoration of habitat

SC #4: Human needs

Livability
Clean air, water
Access to nature
Get from here to there
Safe, stable neighborhoods
Strong regional economy
Access to arts/culture

Equity/fairness
Resources for future generations
Basic human needs
Income disparity

Please see the Appendix for the complete framework, including suggested eco-metrics.

Advice about refining the metrics

The metrics we have provided you are only a place to begin. In many cases, more research will need to be done to define a sustainable level or target. In general, however, you'll need to develop sustainability metrics to supplement your eco-efficiency measures.

Eco-Efficiency Metrics		Sustainability Metrics
Loads	→	Impacts
Direction	→	Target Zone
Discrete & Static	→	Systemic & Dynamic

Then you'll need to select key indicators to track for a period of time. People cannot attend to and action on many dozens of metrics. Ideally each person should only have to focus on a handful. Here are a couple options for compressing the list:

- Use indices which combine several types of metrics
- Nest metrics
- Pick a focus for a period of time
- Manage by exception, when a measure falls outside of an acceptable range
- Assign different metrics to different people

All of these methods have associated risks and benefits. For example, indices and nesting can obscure important issues in the data. Picking a focus for a period of time or assigning metrics to individuals can lead to people maximizing one factor at the expense of another. But the human brain does not process mass quantities of data well. So use these methods, but watch out for the potential unintended side effects. Dive into the details and look at the whole picture periodically.

Qualities of Successful Metrics

Develop a core set of metrics universally accepted with additional metrics specific for each facility.

- Few, robust (important and action-able)
- Simple to collect, calculate, understand
- Based on available data
- Promotes the right behavior
- Drives and documents continual improvement
- Improves environmental performance

Appendix A - Energy Audit Results

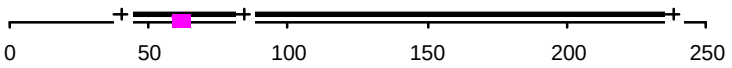
This section shows the results for each of the four facilities audited. The "base case" is calendar year 2000. The "projected case" adjusts those figures to estimate the impact of currently planned expansions and conservation measures we are recommending. The energy usage index shows the range of energy consumption for similar facilities, but the closest comparable data for the events facilities was retail. The MRC was compared to other office buildings. The low, median and high ranges come from Bonneville Power Administration's ELCAP database of selected industries. These data points are intended to provide a qualitative comparison of how Metro's buildings compare to what is "typical". The consumption has been adjusted for any atypical weather for the year. The purpose of presenting these data as a range is to illustrate that there is wide variability between buildings. So these comparisons should not be viewed as a quantitative benchmark. In that sense, they provide a quick visual context -- you can examine the range to see if 100 kBtus is high or not. Obviously, there is some variation by the type of facility and the level of occupancy.

Metro Regional Center

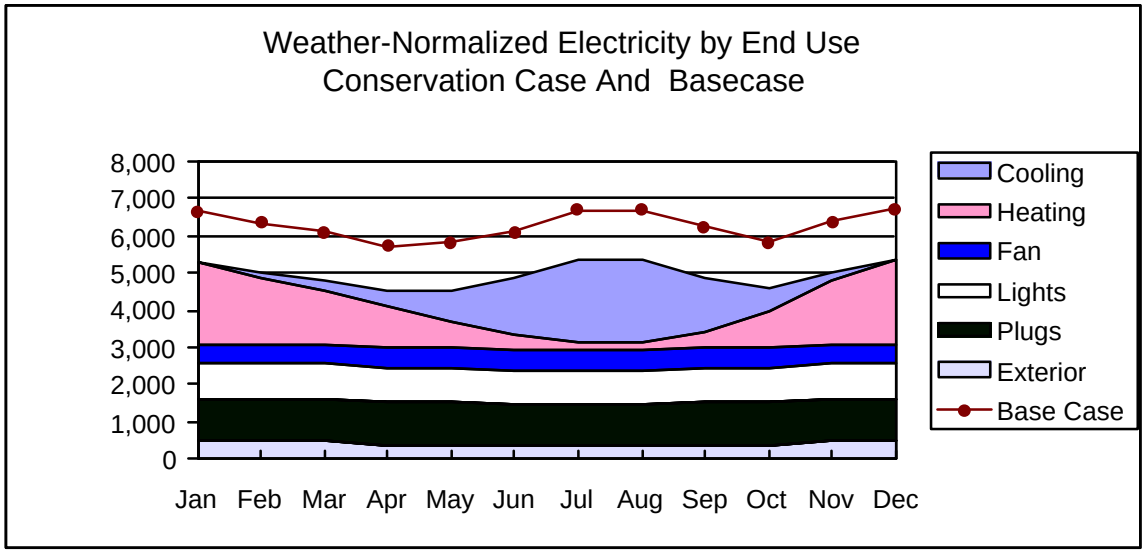
Energy Usage Index (EUI)

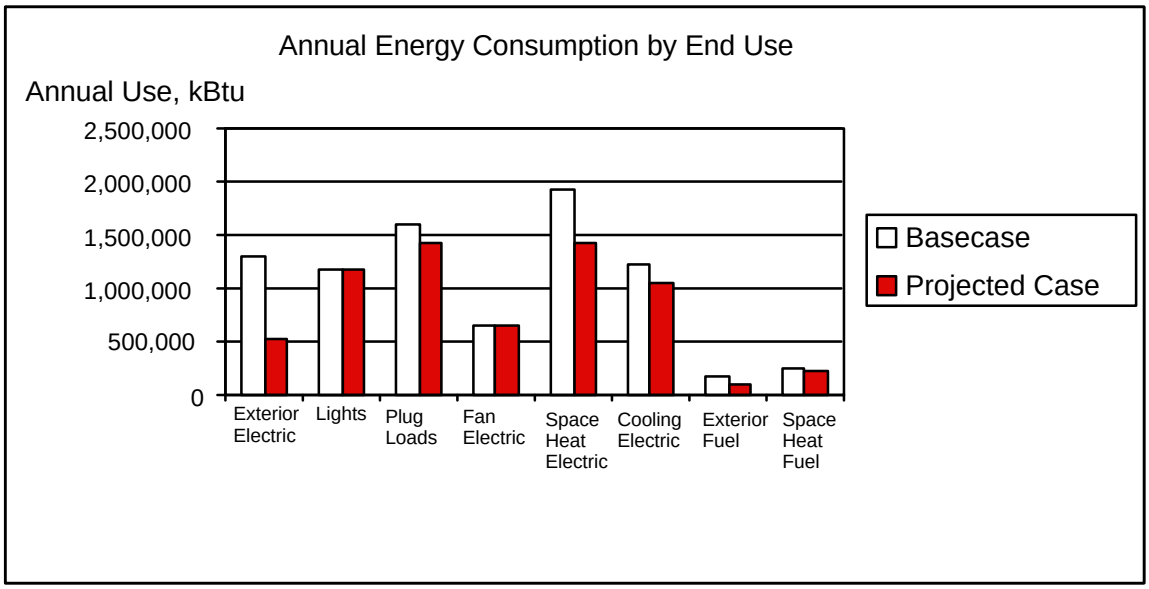
Weather adjusted consumption is 61 kBTU/ft2 per year for this facility.

The low, median and high ranges of consumption are 40, 84, and 238 respectively.



The breakdown of electric energy use is shown throughout the year the Projected Case with conservation measures compared against the year 2000 Basecase.



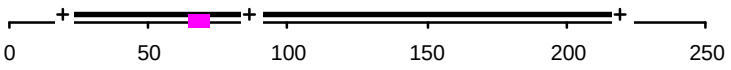


	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	1,286,018	520,837
Lights	1,157,434	1,157,434
Plug Loads	1,595,595	1,412,214
Fan Electric	634,227	634,227
Space Heat Electric	1,907,432	1,427,209
Cooling Electric	1,231,701	1,040,079
Exterior Fuel	159,455	98,912
Space Heat Fuel	238,429	203,887

Convention Center

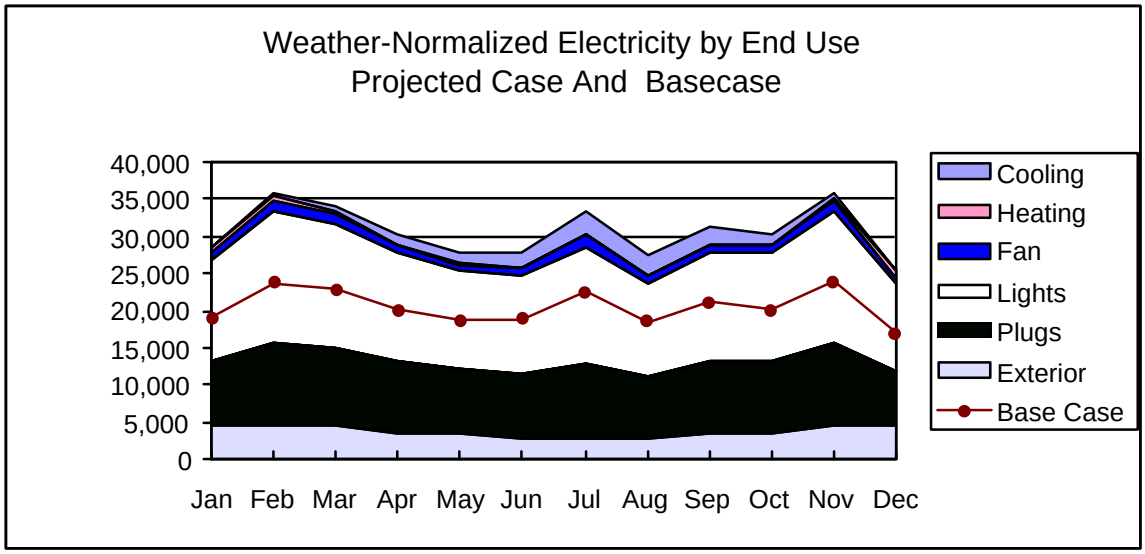
Energy Usage Index (EUI)

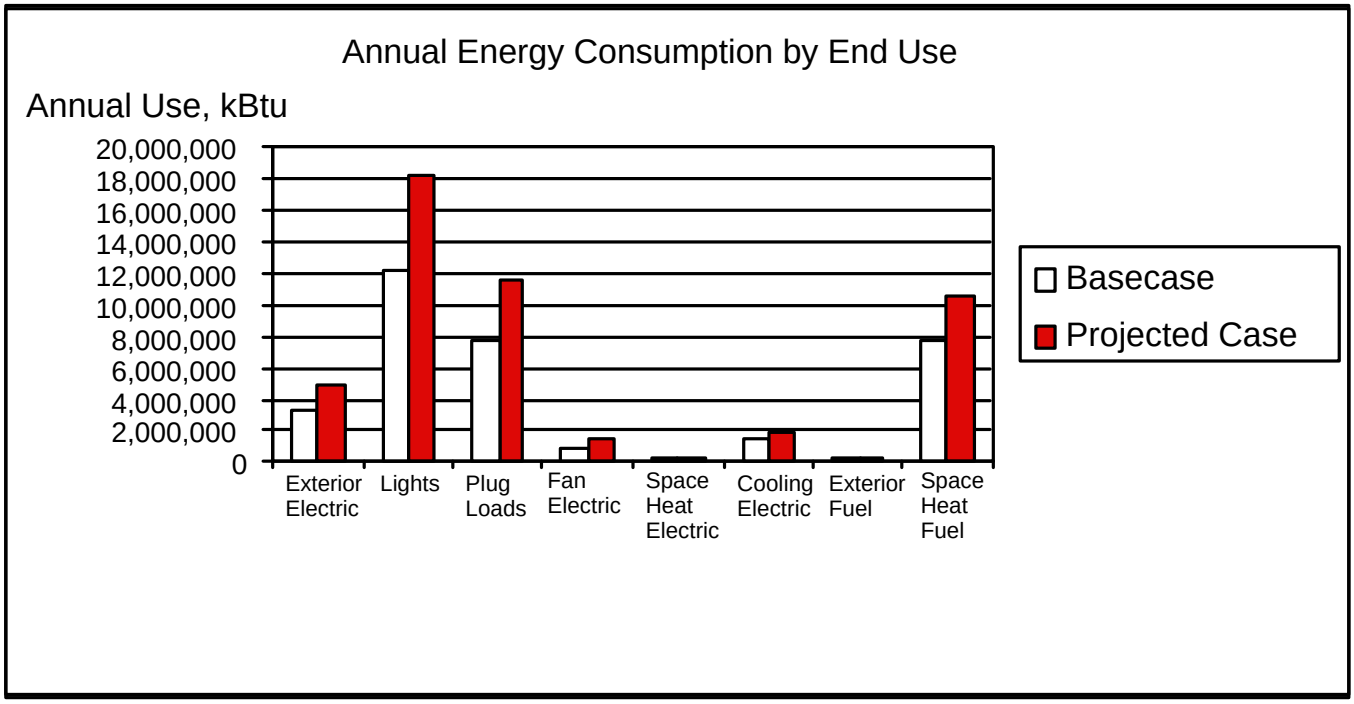
Weather adjusted consumption is 67 kBTU/ft2 per year for this facility.



The low, median and high ranges of consumption are 19, 86, and 219 respectively.

The breakdown of electric energy use is shown throughout the year the Projected Case with the new expansion compared against the year 2000 Basecase.



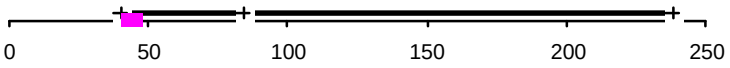


	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	3,215,046	4,822,569
Lights	12,170,410	18,255,615
Plug Loads	7,717,821	11,576,732
Fan Electric	904,700	1,380,972
Space Heat Electric	273,568	370,011
Cooling Electric	1,303,604	1,772,507
Exterior Fuel	149,489	224,234
Space Heat Fuel	7,816,236	10,571,745

Expo

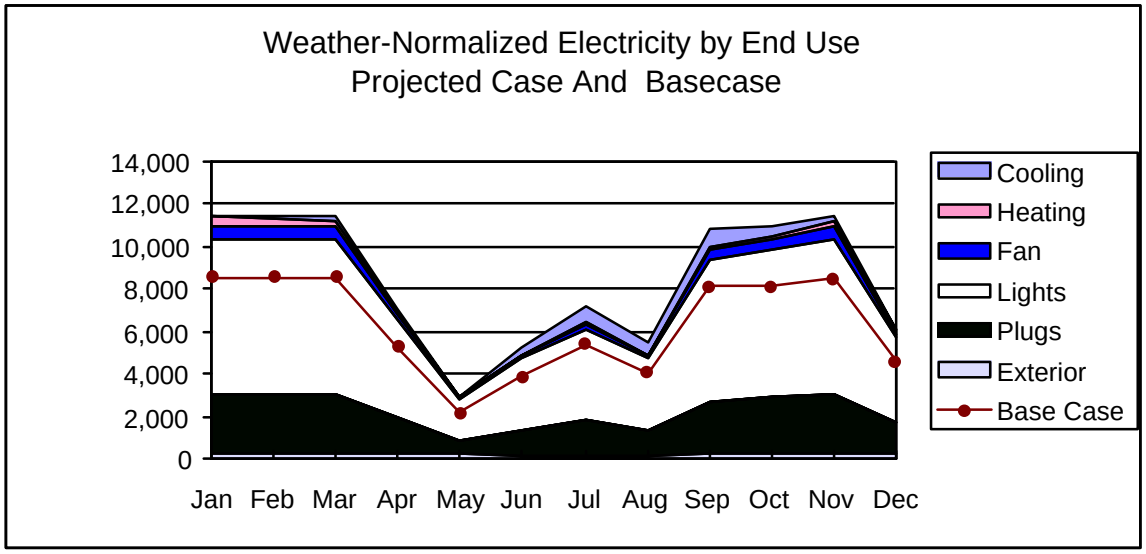
Energy Usage Index (EUI)

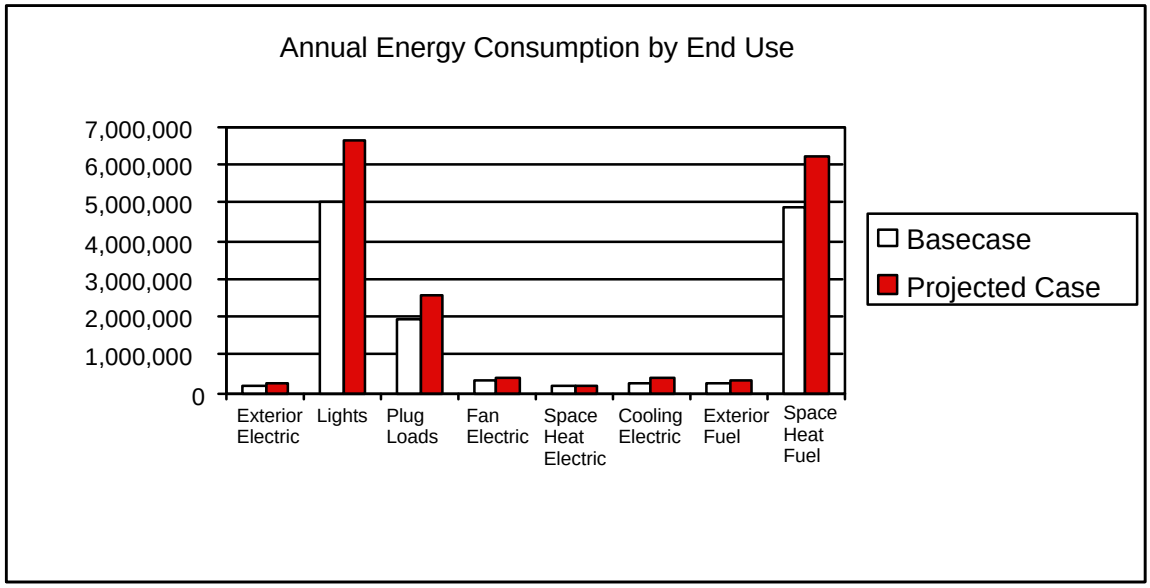
Weather adjusted consumption is 43 kBTU/ft2 per year for this facility.



The low, median and high ranges of consumption are 40, 84, and 238 respectively.

The breakdown of electric energy use is shown throughout the year the Projected Case with the new Hall D compared against the year 2000 Basecase.





	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	192,903	257,204
Lights	4,991,912	6,655,882
Plug Loads	1,919,966	2,559,955
Fan Electric	302,568	421,123
Space Heat Electric	170,517	218,402
Cooling Electric	270,603	376,375
Exterior Fuel	269,081	358,775
Space Heat Fuel	4,871,908	6,240,049

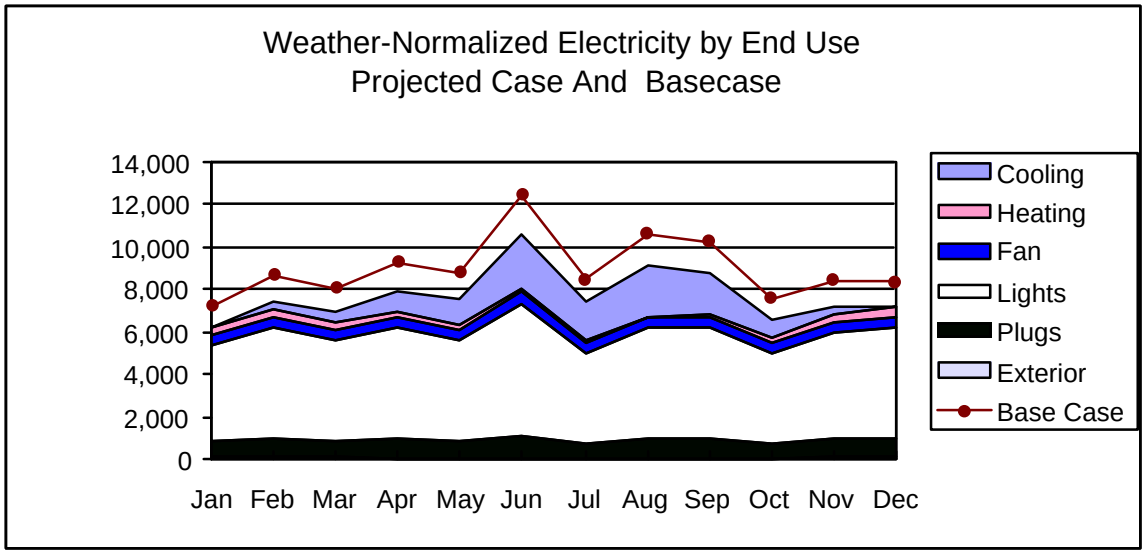
Keller Auditorium

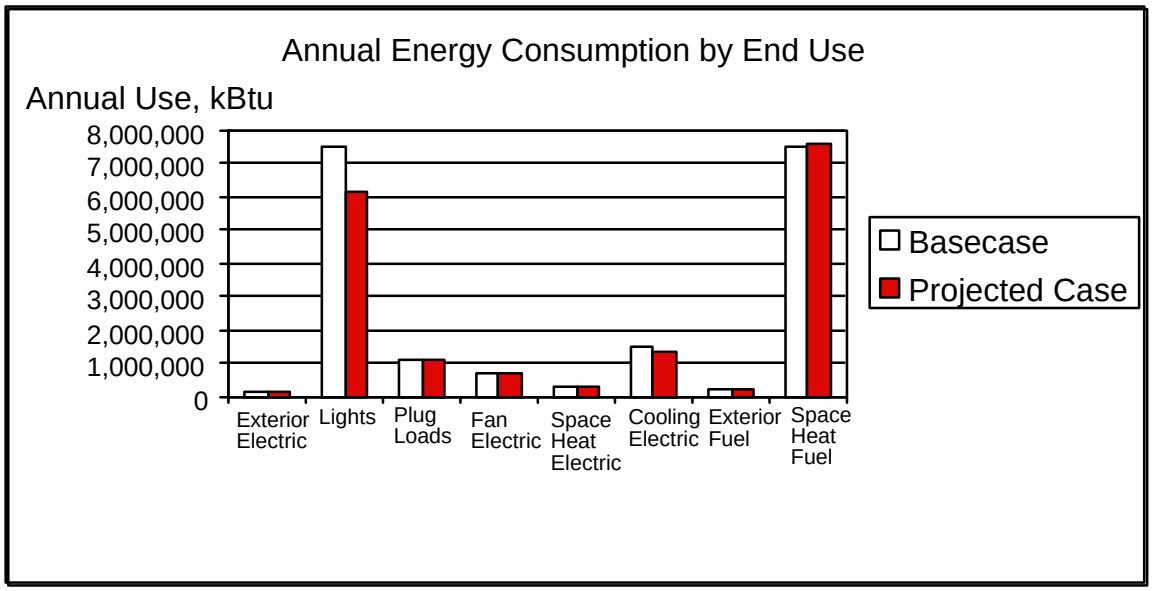
Energy Usage Index (EUI)

Weather adjusted consumption is 129 kBTU/ft2 per year for this facility.

The low, median and high ranges of consumption are 40, 84, and 238 respectively.

The breakdown of electric energy use is shown throughout the year the Projected Case with conservation measures compared against the year 2000 Basecase.



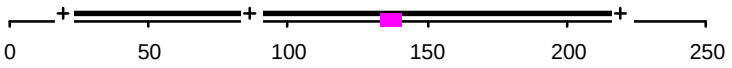


New Theater

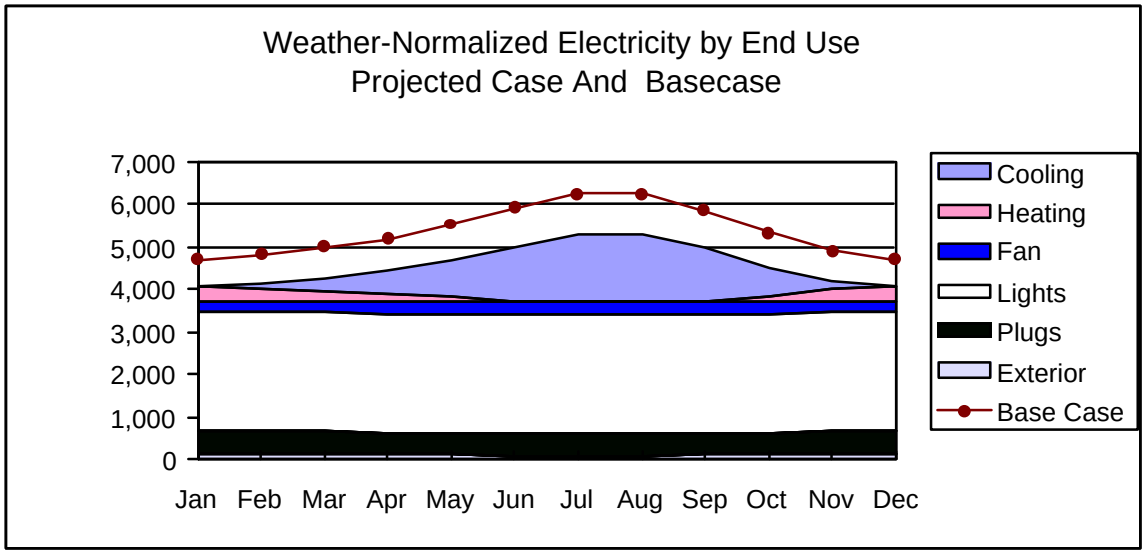
Energy Usage Index (EUI)

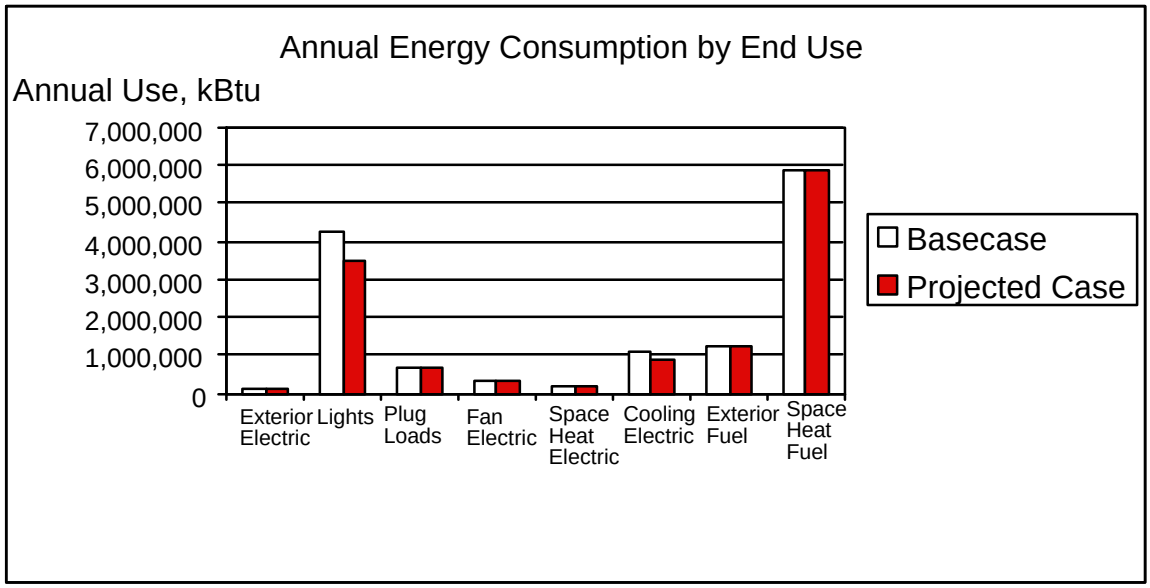
Weather adjusted consumption is 136 kBTU/ft2 per year for this facility.

The low, median and high ranges of consumption are 19, 86, and 219 respectively.



The breakdown of electric energy use is shown throughout the year the Projected Case with conservation measures compared against the year 2000 Basecase.



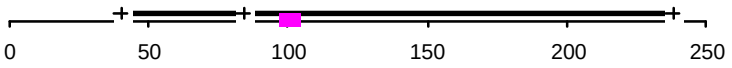


Schnitzer Theater

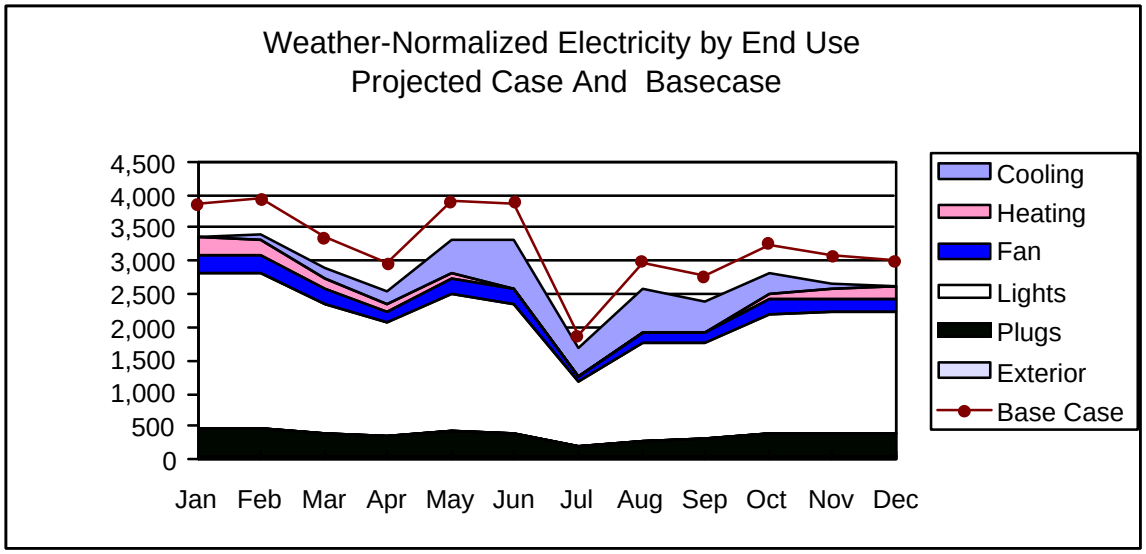
Energy Usage Index (EUI)

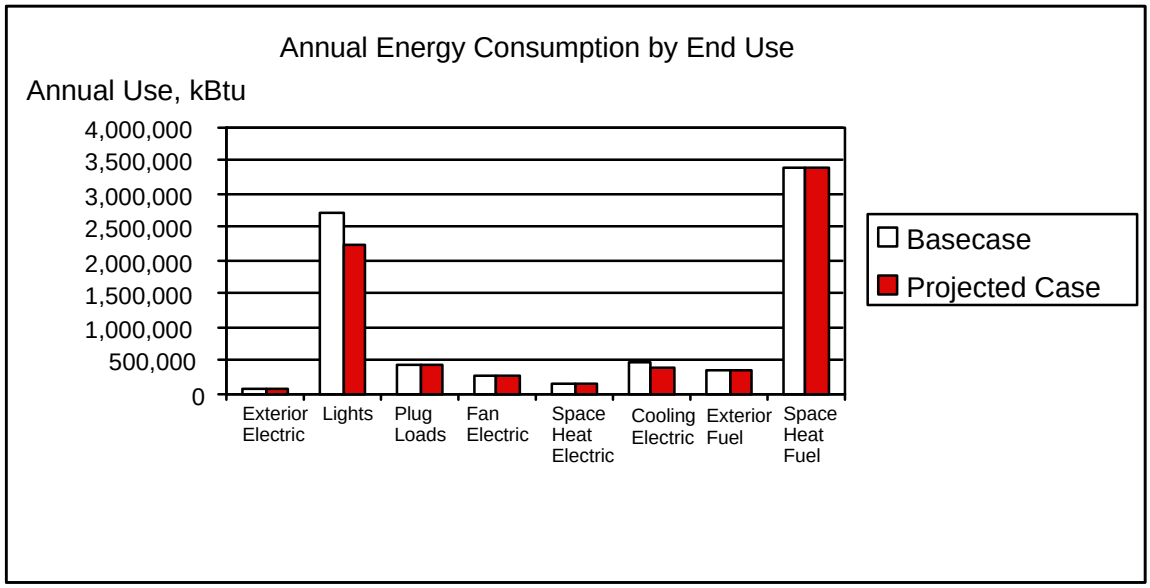
Weather adjusted consumption is 100 kBTU/ft2 per year for this facility.

The low, median and high ranges of consumption are 40, 84, and 238 respectively.



The breakdown of electric energy use is shown throughout the year the Projected Case with conservation measures compared against the year 2000 Basecase.





Keller Auditorium

	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	94,236	94,236
Lights	7,530,919	6,136,808
Plug Loads	1,107,488	1,107,488
Fan Electric	672,524	659,842
Space Heat Electric	292,387	294,282
Cooling Electric	1,521,055	1,353,761
Exterior Fuel	219,084	219,084
Space Heat Fuel	7,497,105	7,545,690

New Theater

	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	129,983	129,983
Lights	4,235,065	3,473,924
Plug Loads	683,075	683,075
Fan Electric	346,141	346,141
Space Heat Electric	203,780	203,952
Cooling Electric	1,097,502	881,907
Exterior Fuel	1,226,027	1,226,027
Space Heat Fuel	5,822,285	5,827,205

Schnitzer Theater

	Basecase	Comparison Case
Energy End Use	Annual kBtu	Annual kBtu
Exterior Electric	49,914	49,914
Lights	2,697,950	2,245,658
Plug Loads	424,206	424,206
Fan Electric	257,387	257,387
Space Heat Electric	132,517	132,414
Cooling Electric	468,663	378,504
Exterior Fuel	331,546	331,546
Space Heat Fuel	3,397,881	3,395,236

Appendix B - Water Audit Results

Background

In 1993, the City of Portland began a program to reduce water consumption in the business (commercial), industrial and government (institutional) sectors of its customer base. This program is known as the Business, Industry and Government (BIG) Water Conservation Program. Since the program's inception, staff have made site visits to hospitals, restaurants, hotels, government customers such as the Port of Portland, Portland Public School District and Parks Bureau, and various manufacturing facilities to discuss opportunities for water conservation. Water consumption has been reduced at a number of facilities either as a direct result of BIG Program visits or by individual customer initiatives to implement conservation.

The Regional Water Supply Plan (RWSP) for the Portland metropolitan area recognizes that there are opportunities within the region to enhance conservation activities. The RWSP encourages the region's water providers to explore viable conservation opportunities with special emphasis on the BIG sector. The RWSP recommends that the viability of non-potable options and dual systems be explored as an alternative to developing new potable water supplies. The City of Portland has also adopted sustainability objectives. These objectives recognize the need to conserve resources and the Portland City Council has communicated a desire to look at water issues from a total water cycle perspective. Citizens have expressed great interest in reuse/recycling of water and other resources.

Some general water conservation measures for landscaping include:

- Mulch beds heavily to reduce evaporative losses.
- Use irrigation controllers.
- Irrigate at night to reduce evaporation losses.
- Vary the controller schedule to match the evapo-transpiration rate.
- Use a drip system for trees and shrubs.
- Have similar plants in the same irrigation zones.
- Conduct an irrigation audit.
- Sub-meter the irrigation system for sewer credits and leak detection.
- Install a rain sensor or soil moisture probe.
- Use drought tolerant plants.

The BIG Program recommends water conservation measures to customers if they fall within the customers acceptable payback. Some customers choose to go beyond the economics and they are also assisted. The BIG Program has also expanded to include leak detection services at customers facilities.

The Water System: The Portland Water Bureau's primary source of water is the Bull Run watershed. There are two reservoirs located about 25 miles east of Portland near Mt. Hood. The watershed is hydraulically isolated from Mt. Hood and is primarily a rain driven system. The total storage capacity of both reservoirs is approximately 17 billion gallons. Of this about 10 billion gallons is usable. Power is generated at both dams. Portland's Bull Run surface water source is one of the few in the nation that meets criteria for avoiding filtration. However more stringent water quality regulations will require further treatment. This could be ultraviolet light, ozone, or filtration. Drawdown of the reservoirs typically starts in early July. The National Marine and Fisheries Service has listed two fish species (steelhead and chinook salmon) as "threatened" in the Sandy River Basin where the Bull Run watershed is located. Flow releases into the Bull Run River will be increased during the summer months to aid the recovery of these fish species. The City's second source of supply is the Columbia South Shore well field. The well field is used both as emergency back-up supply during turbidity events in the Bull Run and as supplemental summer supply. The hardness level of the well water is approximately ten times greater than Bull Run water.

Water and sewer rates: As of July 1, 2001 the water and sewer rates will be $1.50/CCF and $4.24/CCF respectively. One CCF is 748 gallons. The Water Bureau meters the incoming water to the facility. For

billing purposes the Bureau of Environmental Services bills the sewer volume based on the water volume. But non-residential customers can get sewer credits by demonstrating that some of the water does not enter the sanitary sewer.

The two primary sewer credits that customers get are irrigation and cooling tower evaporative losses. Customers can sub-meter their irrigation systems and cooling tower make-up and blowdown. By reporting the readings monthly, the irrigation and evaporation volumes are deducted from the total billed sewer volume. For instance, if a facility uses 1,000 CCF of water and of that 200 are for irrigation and 100 is the evaporative loss (make-up volume minus blowdown), then the billed sewer volume is 700 CCF. A savings of almost $1,300.

Alternate Water Sources: The City of Portland has recently changed the plumbing code to allow for the collection of rainwater to be used for non-potable purposes such as toilet and urinal flushing, irrigation, and cooling tower make-up. The use of groundwater will fall under the same code. The approval of the systems will be on a case by case basis. There are very stringent rules to prevent cross connection with the potable system. A non-potable water system will require dual plumbing: one for potable and one for non-potable. This can be expensive for a building retrofit. The non-potable system will also need to have potable water as a back up supply. The amount of treatment that the non-potable water will require will depend on its intended use.

King County, WA has installed a non-potable system for toilet flushing. The system is predominantly rainwater but has the ability to collect the groundwater from around the foundation. This system was designed into the new building.

In Portland there is very little precipitation during the summer months. In order to use a rainwater system during the summer there will have to be sufficient storage. The design of a rainwater system should consider this and the water usage patterns of the facility. If a facility uses most of its water during the summer it will require a large storage tank.

Some general water conservation measures for cooling include:

- Eliminate the use of single pass cooling water unless air-cooled is not practical.
- Sub-meter the cooling tower make-up water and blowdown for sewer credits and to quickly identify problems.
- Automate the blowdown.
- Monitor the conductivity of the cooling tower basin water to check the cycles of concentration.
- Use variable speed fans in the cooling tower.
- Carefully monitor the cooling tower water to prevent scale forming on heat exchanging surfaces.

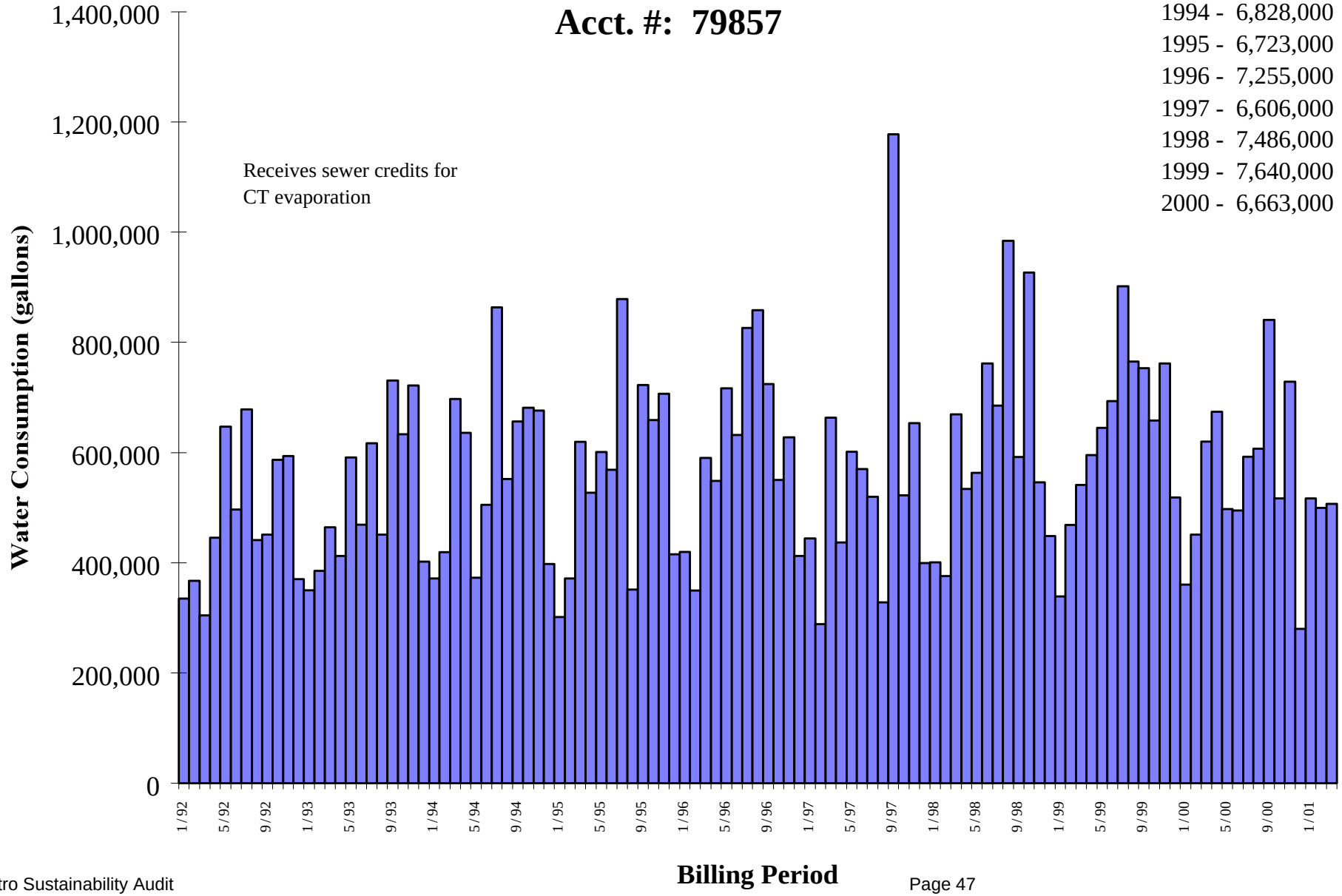
Although City code does not currently allow it, treated graywater and wastewater have the potential to be used for non-potable purposes. Both of these would require further treatment, especially the wastewater. Treating wastewater is more difficult due to the nature and variety of the waste, and falls under very stringent regulations.

Although it is technically possible to treat alternate water sources for potable purposes, that falls under State of Oregon rules regarding water systems.

Oregon Convention Center
777 Martin Luther King Blvd.
Acct. #: 79857

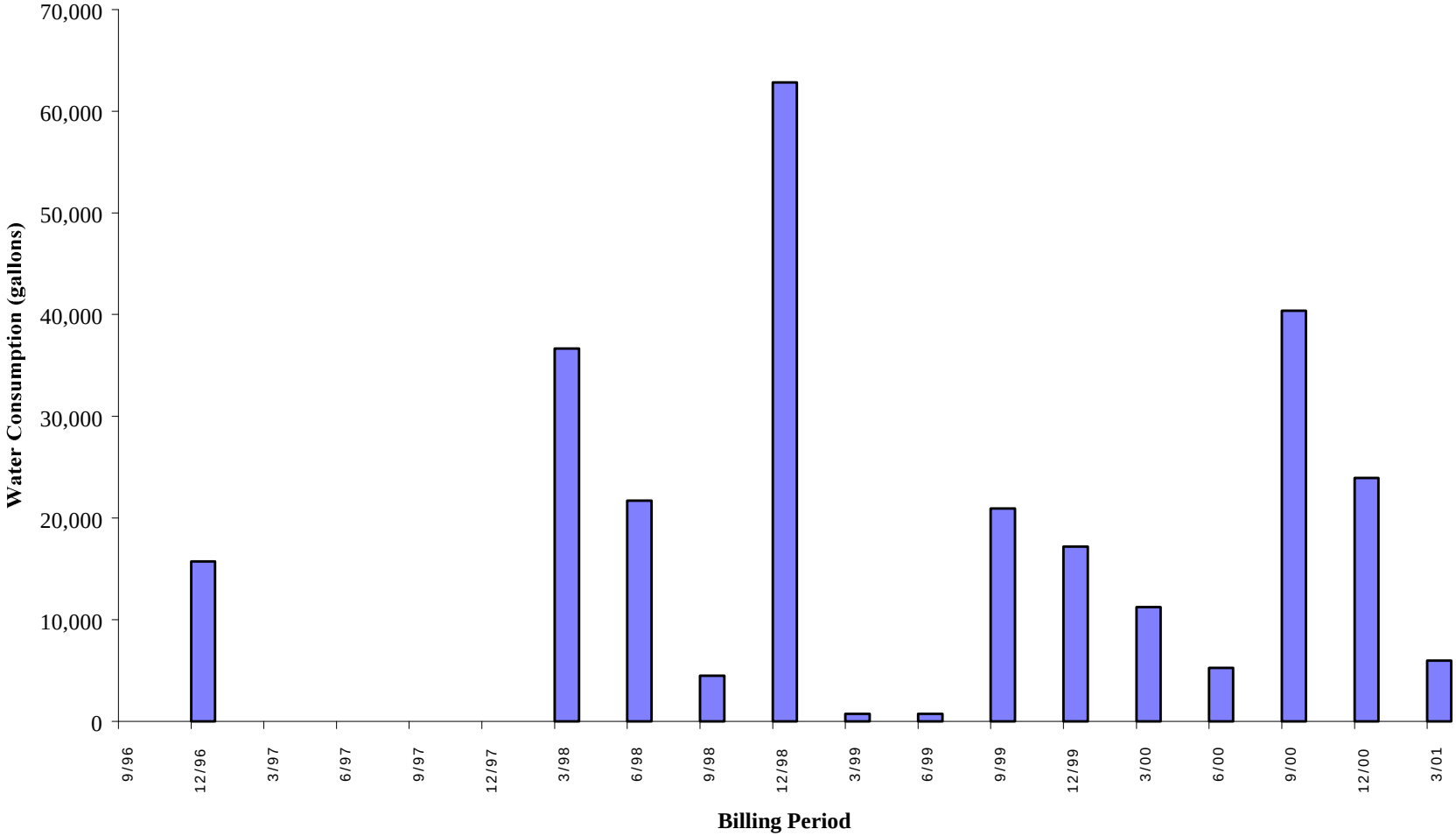
Annual Consumption

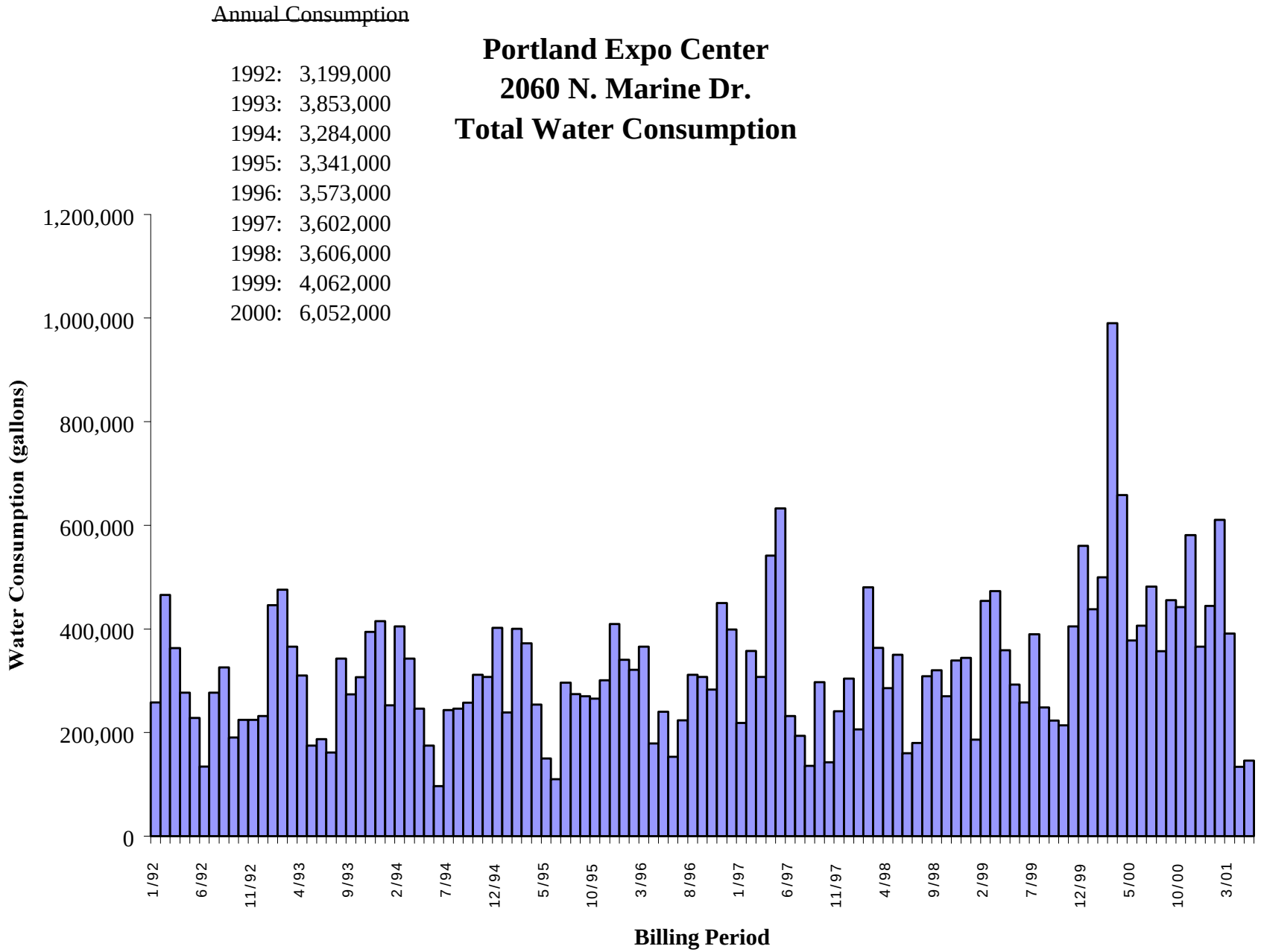
1992 - 5,717,000
1993 - 6,227,000
1994 - 6,828,000
1995 - 6,723,000
1996 - 7,255,000
1997 - 6,606,000
1998 - 7,486,000
1999 - 7,640,000
2000 - 6,663,000



Oregon Convention Center
298 NE Holladay
Acct. #: 78251
(Irrigation)

Annual Consumption	
1997 -	0
1998 -	125,000
1999 -	39,000
2000 -	80,000



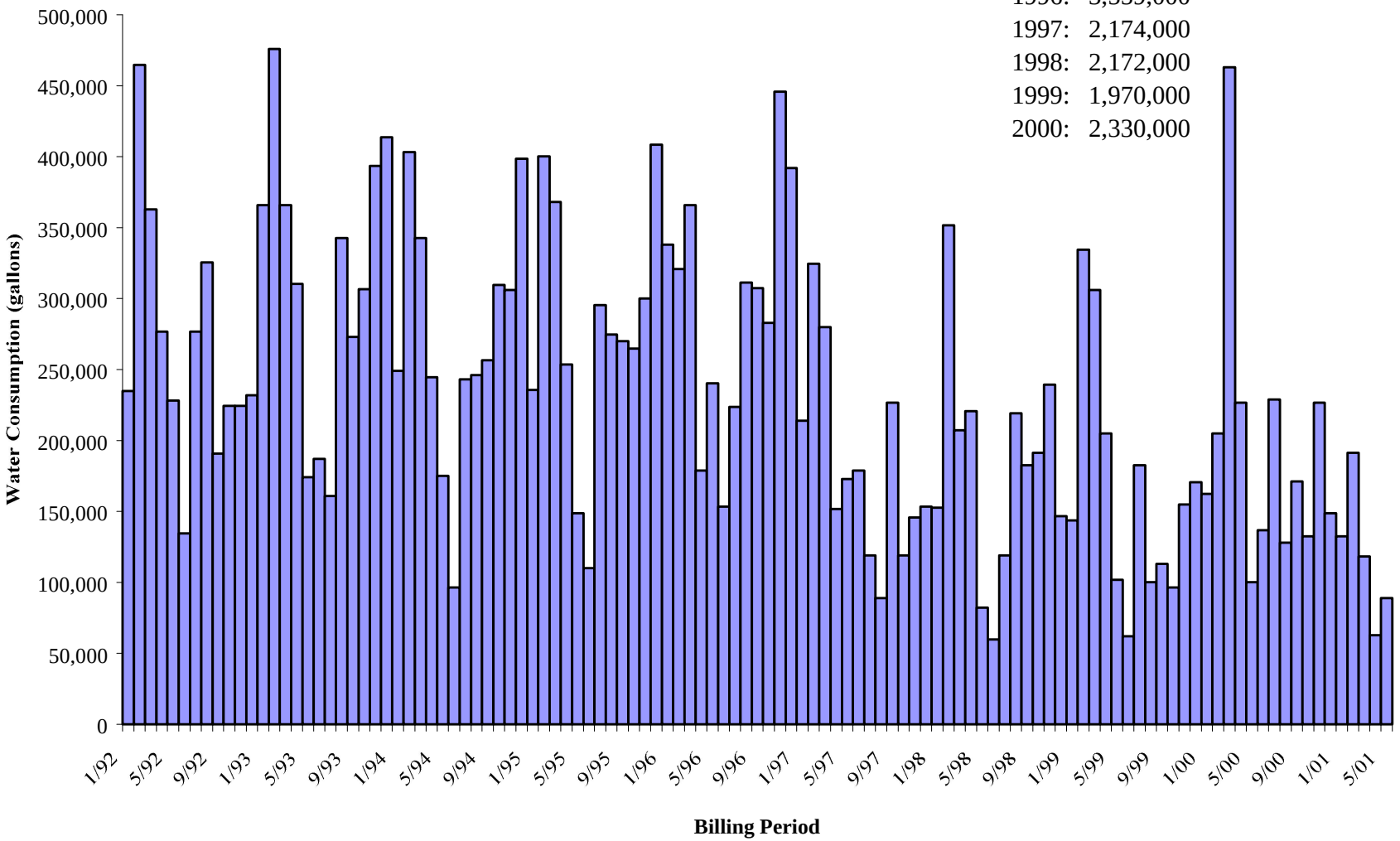

Annual Consumption
1992: 3,199,000
1993: 3,853,000
1994: 3,284,000
1995: 3,341,000
1996: 3,573,000
1997: 3,602,000
1998: 3,606,000
1999: 4,062,000
2000: 6,052,000
Portland Expo Center
2060 N. Marine Dr.
Total Water Consumption
Water Consumption (gallons)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
1/92
6/92
11/92
4/93
9/93
2/94
7/94
12/94
5/95
10/95
3/96
8/96
1/97
6/97
11/97
4/98
9/98
2/99
7/99
12/99
5/00
10/00
3/01
Billing Period

Mtr #: 31933958
Trident 4"
223' W EL of bldg

Portland Expo Center
2060 N. Marine Dr.
Acct. #: 33536

Annual Consumption

1992:	3,175,000
1993:	3,769,000
1994:	3,271,000
1995:	3,329,000
1996:	3,559,000
1997:	2,174,000
1998:	2,172,000
1999:	1,970,000
2000:	2,330,000

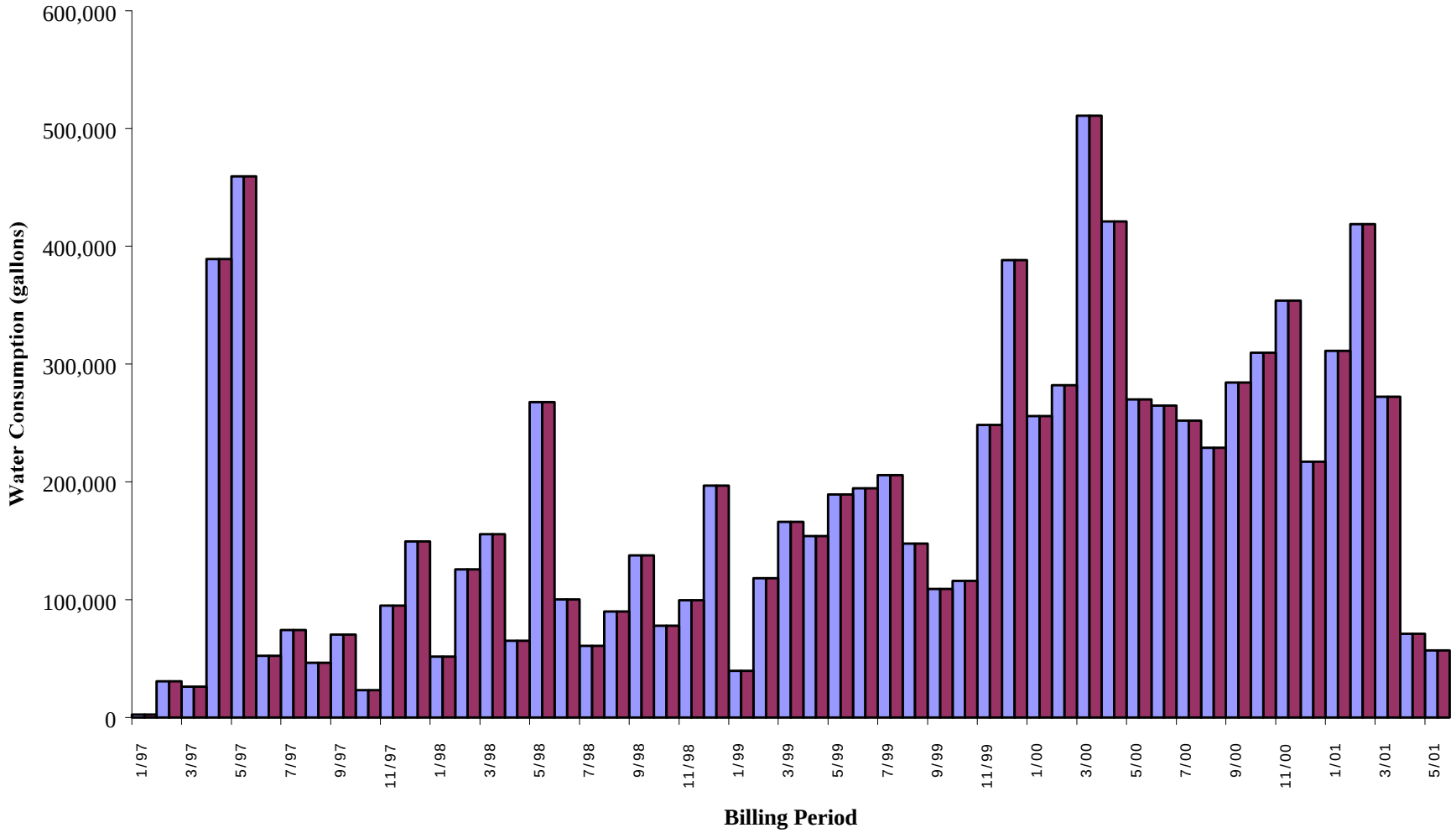


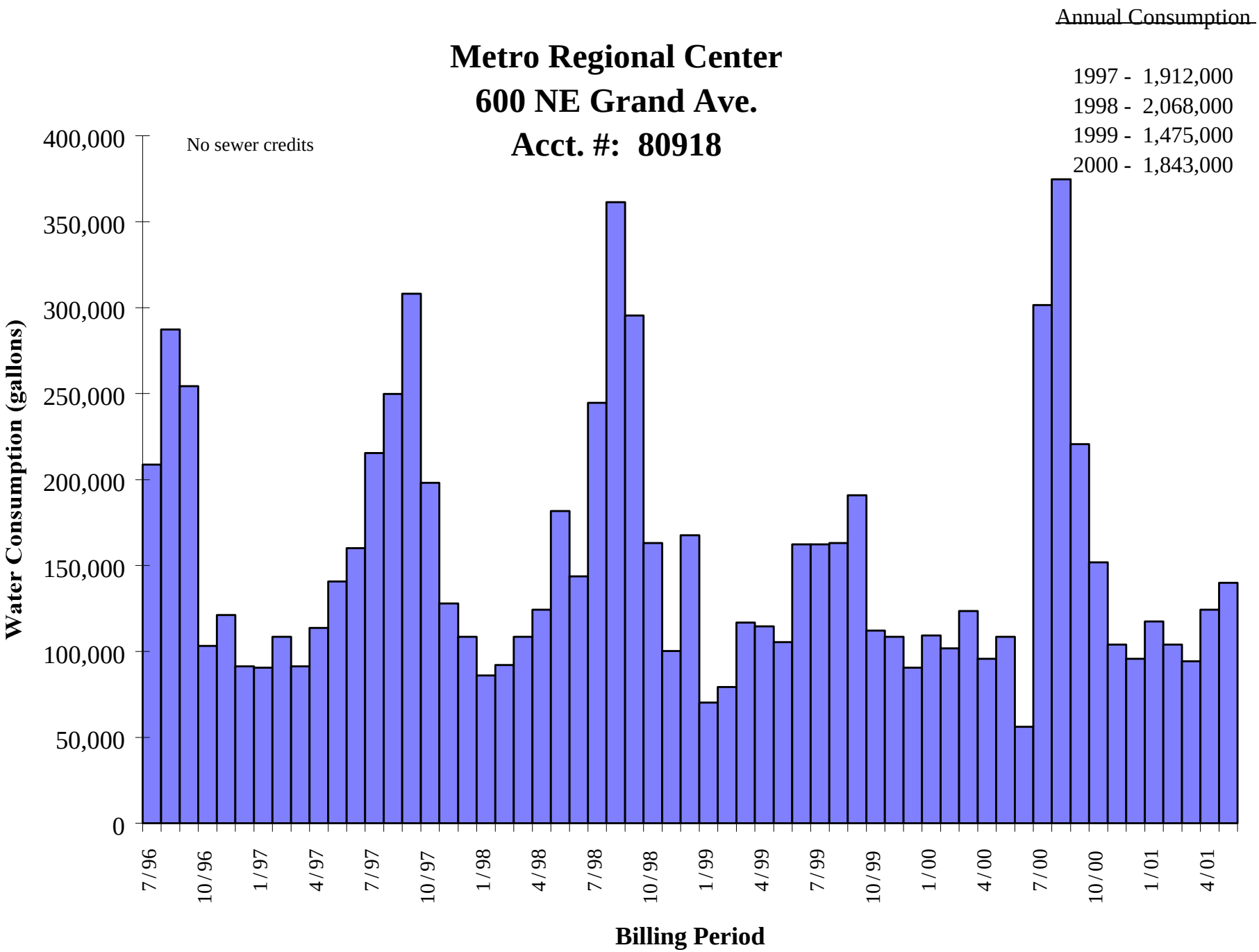
Mtr #'s: 96240283 & 96240283
Badger 2"
CB/SB Force 15' NLB of fire vault

Portland Expo Center
2060 N. Marine Dr.
Acct. #: 33538
(Halls D & E)

Annual Consumption

1997:	1,418,000
1998:	1,427,000
1999:	2,076,000
2000:	3,650,000




Metro Regional Center
600 NE Grand Ave.
Acct. #: 80918
No sewer credits
Annual Consumption
1997 - 1,912,000
1998 - 2,068,000
1999 - 1,475,000
2000 - 1,843,000
Water Consumption (gallons)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
7/96
10/96
1/97
4/97
7/97
10/97
1/98
4/98
7/98
10/98
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7/99
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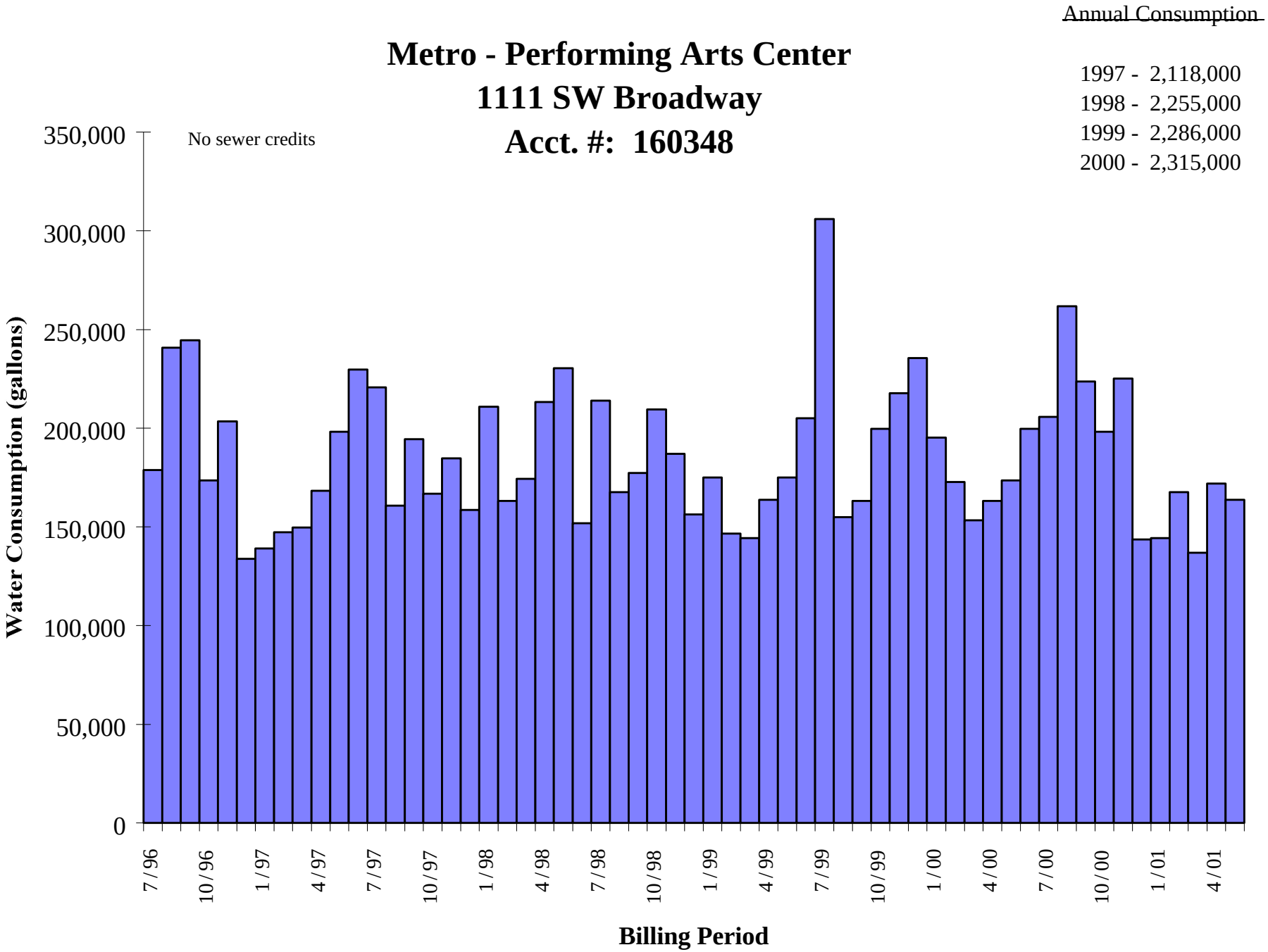
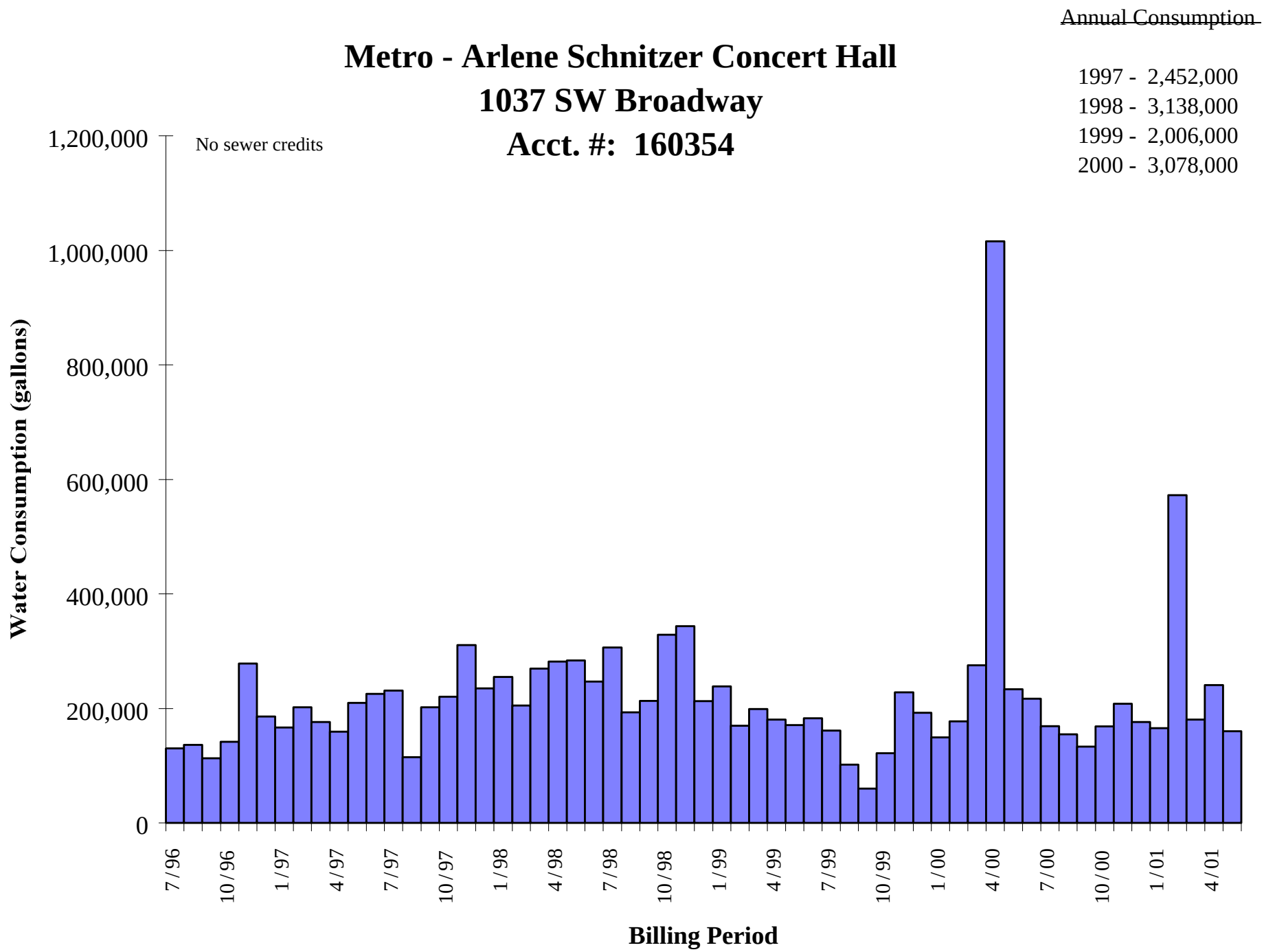
10/00
1/01
4/01
Billing Period

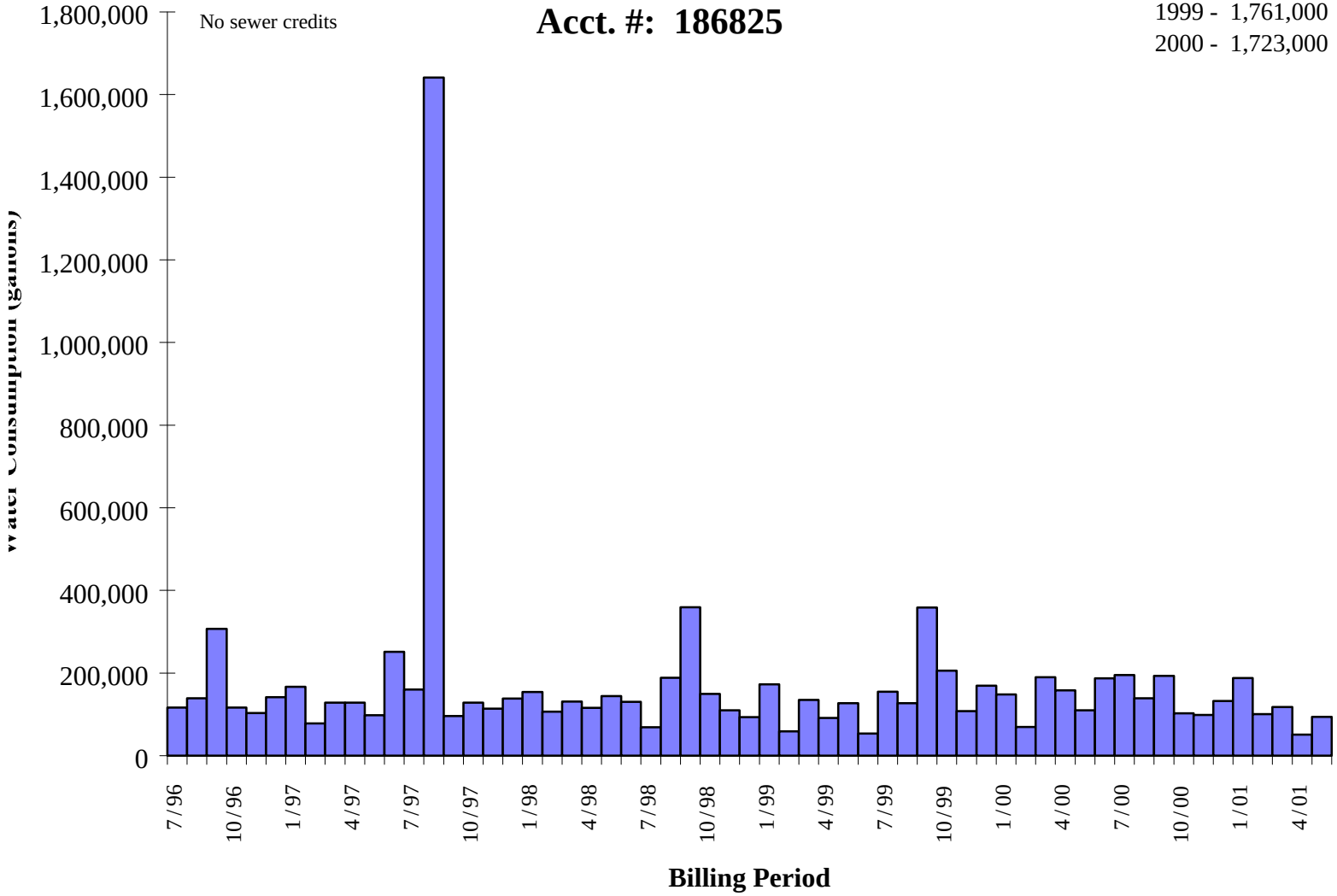

Annual Consumption
1997 - 2,118,000
1998 - 2,255,000
1999 - 2,286,000
2000 - 2,315,000
Metro - Performing Arts Center
1111 SW Broadway
Acct. #: 160348
No sewer credits
Water Consumption (gallons)
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
7/96
10/96
1/97
4/97
7/97
10/97
1/98
4/98
7/98
10/98
1/99
4/99
7/99
10/99
1/00
4/00
7/00
10/00
1/01
4/01
Billing Period


Metro - Arlene Schnitzer Concert Hall
1037 SW Broadway
Acct. #: 160354
No sewer credits
Annual Consumption
1997 - 2,452,000
1998 - 3,138,000
1999 - 2,006,000
2000 - 3,078,000
Water Consumption (gallons)
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
7/96
10/96
1/97
4/97
7/97
10/97
1/98
4/98
7/98
10/98
1/99
4/99
7/99
10/99
1/00
4/00
7/00
10/00
1/01
4/01
Billing Period

Metro - Keller Auditorium
1520 SW 3rd Ave.
Acct. #: 186825

Annual Consumption

1997 - 3,128,000
1998 - 1,751,000
1999 - 1,761,000
2000 - 1,723,000



Appendix C-Recommendations by Type

The following chart lists all the recommendations in this report by type (do now, save for later, investigate, etc.) for the facilities and transportation issues.

For a good return on investment

- Install Vending Miser (TM) on soda **vending machines**.
- Consider installing a **graywater heat exchanger** on showers.
- Continue to identify **lighting fixtures** that could be replaced with lower wattage fixtures in office building.
- Move the poorly located **temperature sensor** to improve cooling system operation.
- Over time, move toward **waterless urinals** (now in use in Wilsonville) and two-button **toilets** (tank-type) or ultra-low-flow toilets, especially in high use restrooms.

Do now

- Develop a **long range plan** to become sustainable which takes into account long term plans for expansion, remodeling, demolition, operations.
- Begin gathering **baseline data on visitor transportation** choices.
- Institute a policy to exchange **CFC-using equipment** with HCFC models when on replacement.
- Over time, change all your **landscaping** to a zero-irrigation or almost zero system.
- Develop a procurement policy for efficient **computers/office equipment** in MRC. Make default settings based on energy and resource efficiency (e.g., duplex printing, sleep modes, etc.).
- The **irrigation system** should be sub-metered.
- Replace the commercial **laundry washer** in the day care center with an energy and water efficient model, sizing the unit for the typical loads. Care should be taken to use the small load settings as appropriate.
- At the Expo, along with beginning a **rainwater catchment system** (at least for exterior use such as irrigation and car washing), provide the grounds keepers a water tank that will fit in the back of a pickup (preferably an alternative fuel vehicle).
- Ask Tri-Met to install an **automatic people-counter** at the Max stop to make it easier to judge the effectiveness of the Ticket to Ride program (see Transportation).
- Set a firm date for **deconstructing the old facilities.**
- The **PAC cooling tower** should be sub-metered.
- Try lowering the **faucet flow rates** at the Schnitzer to an acceptable level by reducing the pressure. Try lowering the faucet flow rate to 1 gpm at the Keller.
- Reevaluate the design of the **expansion** to maximize the number of sustainable/green technologies you can incorporate.

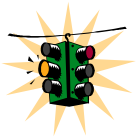
- Start reporting the **irrigation sub-meter readings** for a sewer credit. .
- Fix a small **leak in the irrigation** service to the median on NE Holladay.
- If possible, adjust the **spring activated faucets** for about 5-10 seconds.

Demonstrate leadership

- Show **energy usage associated with events** on their bills.
- Consider replacing the **glass in the atrium** with tinted PV glass.
- Drive **exhibitors** to be more conscientious about waste through education, incentives and consequences.
- Since **lighting** is the primary energy user and many events bring in their own lighting equipment, implement lighting efficiency standards for all events.
- Consider building a **living machine** to process some of your waste as a demonstration project.
- At the MRC, provide bus tickets instead of **parking validation**.
- Set up a **"Ticket to Ride"** system of ticket sales so that event tickets are valid on Tri-Met.
- Similarly, develop a **feebate system** for out-of-town visitors to conference events at the Oregon Convention Center.
- In the same vein, find opportunities to **reward people who ride bikes or walk** to certain events such as those on the Waterfront.
- Investigate subsidizing employee membership in **CarSharing.**
- Replace gasoline cars in fleet with **hybrid/hypercar** vehicles as you retire them.
- Convert any **larger vehicles** to natural gas; convert to fuel cells or other cleaner technologies as these come on the market.

Investigate

- Develop a way to successfully re-enable the **daylighting controls**. Study controls improvements to minimize electric re-heat of cooled air.
- Investigate the use of Earth Tubes to bring in **passive cooling** (from underground) into the atrium area during the summer to offset the greenhouse effect.
- Study the feasibility of **linking chilled water system** between the 1111 SW Broadway building and Schnitzer.
- Continue searching for appropriately dimmable fixtures for **house lights.**
- Collect more data on the flow rates through the **display case coolers** at the Schnitzer.



Save for the appropriate time

- When purchasing **clothes dryers**, use gas models where it is possible to vent them properly.

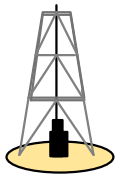
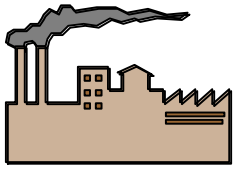
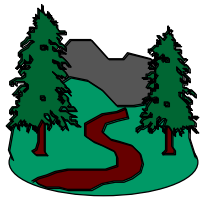
- Investigate using the **human waste to create methane** to power fuel cells once the technology matures.
- Consider using infrared sensors on the **faucets** for any upgrades or remodels.
- Investigate the amount of short **lunch trips and errands** that might be served with a small electric fleet vehicle such as a Sparrow. Then add electric charging stations at your parking garage (fueled by green power).
- If green hydrogen fuel (i.e., hydrogen not from fossil fuels) becomes available for cars, set up a system where **fuel cell vehicles** (either fleet cars or employee-owned vehicles) can be plugged into the grid in your parking lot.
- When the Expo **replacement facility** is built, it should go through a sustainable design process to ensure that all possible features have been considered. The **existing well** should be considered when designing any facility expansions.
- Any **new landscaping** around an expansion should have a drip irrigation system linked to a non-potable source if possible.
- If power supplies become inconsistent and you end up running your **generators** quite a bit more, you might investigate changing the fuel supply (fuel injectors).
- As needed, continue changing out **toilets** to two-button or pressure assisted models.
- When the **glass in the spires** needs to be replaced, consider using PV glazing to generate electricity and reduce the greenhouse effect.

Just another idea

- Build an external **sun screen for the atrium** which will reduce the summer greenhouse effect without appreciably affecting the daylighting.
- In the Schnitzer, put a demand valve that visitors can use on **water fountains.**
- Begin using ultra low sulfur **diesel** or biodiesel in the generators.
- Develop a system for TicketMaster and Fastixx to hook up potential **carpoolers**.

Appendix D-Sustainability Metrics Framework

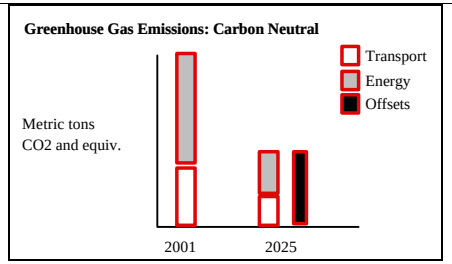
Sustainability Metrics Framework

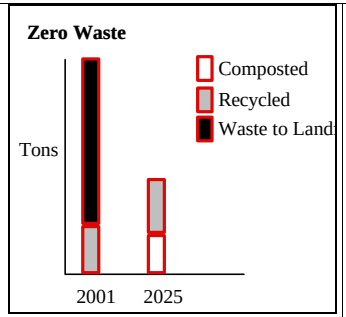
Natural Step System Condition	SC #1 (Crust) 			SC #2 (Manmade) 		SC #3 (Habitat) 			SC #4 (Human needs)	
Impact	Greenhouse gases	Metals	Minerals	Toxics	Waste	Pollution	Over-harvesting	Displacement	Livability	Equity/Fairness
Target for sustain-ability	Carbon neutral (including equivalents)	100% recycled content 100% recycled	Phosphorous, etc. less than or equal to redeposit rate	Zero use of POP's % reduction of other toxics Zero emissions to nature of remaining toxics	Zero waste to landfill Compostables approximately equal decomposition rate	Eutrophication -nitrogen Acid rain-SOX Ozone	Water use less than or equal to rain fall and aquifer recharge rate. 100% natural resources from sustainable sources	Developed land less than or equal to carrying capacity Species extinction approximately background rate Restoration of quality and quantity of habitat and biodiversity; reintroduction of species.	Clean air and water Access to nature Get from here to there Safe, stable neighborhoods Strong regional economy Access to arts & culture	Resources for future generations Basic human needs met for all Income disparity less than ?%

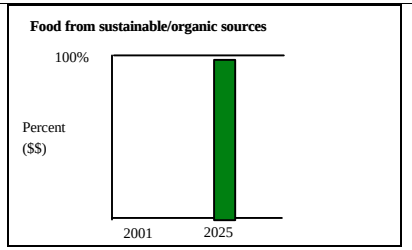
Possible metrics	**Energy** CO2 emissions/year (by source) % sustainable-green power (sources) Units or BTU's/sq. ft./ day (efficiency) Note: day =day of operation; will differ from facility to facility % solar budget (equity) **Transportation** % visitors taking alternative transportation % visitors carpooling % fleet zero emissions vehicles Commuting miles/ employee % alternative employees using alternative transportation Business travel/ employee	% Recycled content % Recycled		% POP-free Lbs of toxics/year Lbs of toxics replaced with alternatives/ year	% Recycling rate (lbs) (trash) % Recycling rate (buildings) % composted (trash) Avg useful life of purchases	Storm water run off pollutant free and approx. stream temperature Gallons of run off Fertilizer use	**Operations** % food from sustainable/organic sources Water use reduced by % of population growth Gallons potable water used in irrigation and other non-potable uses % purchases of natural products from sustainable sources Next best use **Capital projects** % LEED certified (by standard) % materials from sustainable sources; recycled materials	% restoration of habitat % native plants in landscaping Genetic diversity (zoo) Reintroduced species (zoo)	Employee satisfaction survey Average hours worked less than or equal to 40?/week Building air quality Availability of nearby or on-site daycare	**Employees** Diversity of employees approximately that of region % employees at or above living wage Number of EEOC complaints Undesired turnover % disabled employees Ratio of top wage earner to bottom **Contractors/ vendors** Diversity of contractors approximately that of region **Visitors** Accessibility Low-income attendance Satisfaction **Community** Hours of community service $$$ to charity # people trained at no/low cost

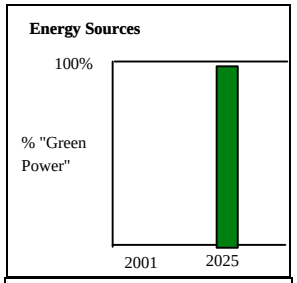
Possible strategies	**Energy** Buy green power Make purchasing policy and defaults based on energy and resource conservation (IT and office equipment) Create a benchmark study of similar facilities **Transportation** Set up "A Ticket to Ride" program with Tri-Met Charge for parking at MRC but provide Tri-Met tickets for those who walk, bike or take mass transit Convert fleet over time to hybrids and hypercars Provide Sparrow or equivalent for close-in trips Increase telework Increase use of tele-conferencing			CFC policy Conduct a full-cost accounting of the use of toxics to get a truer cost Find more benign alternatives to toxics Create a gray list and black list of chemicals for your vendors Review safety practices (use standards, training, etc.) In partnership with OECDD, etc., catalyze projects to create markets for hard-to-recycle products and to find alternatives to toxic substances. Integrated pest management	Do waste stream analysis Evaluate products based on lifetime costs Find alternatives for products that are not easily recycled/ composted Provide separate bins for recyclables, compostables and other waste.	Bioswales Rainwater storage	Use rainwater in all non-potable uses	Eco-roofs Return portion of parking lots to wet lands		

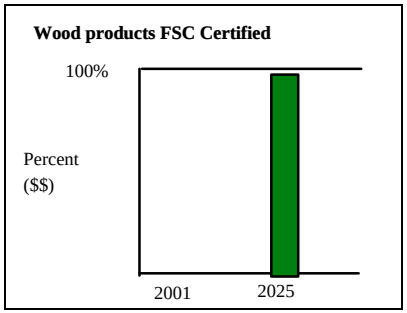
Score-card

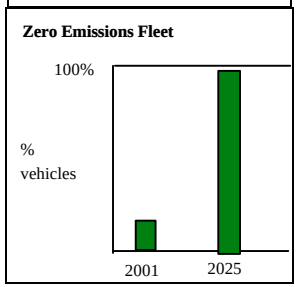

Greenhouse Gas Emissions: Carbon Neutral
Transport
Energy
Offsets
Metric tons
CO2 and equiv.
2001
2025

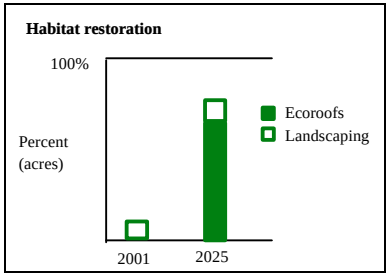

Zero Waste
Composted
Recycled
Waste to Land
Tons
2001
2025

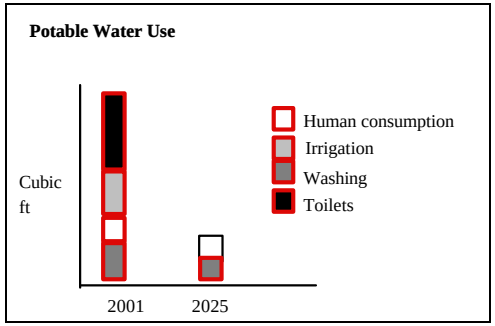

Food from sustainable/organic sources
100%
Percent
($$)
2001
2025


Energy Sources
100%
% "Green
Power"
2001
2025


Wood products FSC Certified
100%
Percent
($$)
2001
2025


Zero Emissions Fleet
100%
%
vehicles
2001
2025


Habitat restoration
100%
Ecoroofs
Landscaping
Percent
(acres)
2001
2025


Potable Water Use
Human consumption
Irrigation
Washing
Toilets
Cubic
ft
2001
2025