

Chapter 8

WATER SHORTAGE CONTINGENCY PLAN

This chapter presents information about how the City of Santa Cruz manages the water system during a water shortage emergency that arises as a result of drought. It also describes actions that would be undertaken in response to a catastrophic interruption of water supplies, including a regional power outage, earthquake, or other emergency situation.

8.1 Background

In 2009, the City of Santa Cruz completed a comprehensive update of its Water Shortage Contingency Plan. The project was an outgrowth of the City's 2005 Urban Water Management Plan, which recognized the many changes in regional conditions and local water supply planning that had taken place over the previous decade, and identified the need to better prepare for the possibility of future water shortages in advance of the next major drought.

One of those changes was the adoption of the Integrated Water Plan, a key component of which involved cutting back or curtailing system water demand by 15 percent in dry years when water is in short supply. Now, instead of treating any shortage as a water supply emergency situation and responding reactively, as it did in the past, the City has effectively accepted the risk of incurring relatively modest shortages every so often, which drove the need for having a fully developed contingency plan and well-defined, measured responses in place.

8.2 Purpose and Goals

The City's Water Shortage Contingency Plan describes the conditions which constitute a water shortage and provides guidelines, actions, and procedures for managing water supply and demands during a declared water shortage. The primary focus of the plan is on measures that reduce customer demand for water, but it also covers actions that can be implemented to stretch or increase the water supply.

This plan was developed to fulfill two fundamental purposes:

1. To establish the procedures and actions necessary to achieve the up to 15 percent cutback in system-wide demand established in the City's Integrated Water Plan, and
2. To describe how the City would respond if faced with much larger shortages in water supply ranging as high as 50 percent.

There are several reasons why it was necessary to consider and plan for shortfalls larger than 15 percent. First, the City remains vulnerable in the near term to a critical water shortage of that scale until it secures an additional source of supply for drought protection. As describe in previous chapters, the City is currently implementing a broad set of water conservation programs and is investigating the possibility of desalination as a new source of water supply. Commissioning of a desalination plant, though, remains years away and is by no means a certainty. Much planning remains to be done and project approvals have yet to be secured. In the meantime, the City is potentially at risk of experiencing a major water shortage, as demonstrated by the recent three years of below normal rainfall and runoff beginning in 2007 that resulted in the Governor's declaration of a statewide drought in 2008 and the declaration by the City of a local water shortage during 2009. Second, the Urban Water Management Planning Act requires all public water suppliers to develop contingency plans for situations of up to a 50 percent shortage in water supply. Finally, the City's long range water supply planning is predicated on past hydrologic records which focused on the two year, 1976-77 event as a worst case scenario. No one can predict how the future will unfold, especially in light of the emerging science of global climate change, which some predict could bring more frequent, longer, or more intense water shortages across the state, and which compounds the uncertainty and risk going forward at the local government level.

Whatever magnitude of shortfall the City may experience, the overarching goals of this plan are as follows:

1. to conserve the water supply of the City for the greatest public benefit,
2. to mitigate the effects of a water supply shortage on public health and safety, economic activity, and customer lifestyle, and
3. to budget water use so that a reliable and sustainable minimum supply will be available for the most essential purposes for the entire duration of the water shortage.

8.3 Planning Process and Water Shortage Management Principles

Development of the City's Water Shortage Contingency Plan was a collaborative effort among the City Water Department staff, the City's Water Commission, City Council, and the public over a three year period beginning in 2006. Research involved reviewing state regulations and legal requirements ([Water Code section 350 et seq.](#)) and the water shortage plans of 21 other urban water utilities from throughout California, and from selected cities in the western United States and across the country. The Water Commission provided its input and recommendations throughout the process.

The subject that generated the most public interest, input, and debate was how to allocate the available water when supplies run short. The issue was discussed before City Council and negotiated with several large customers before reaching a final recommendation.

The plan is based on lessons learned here and from other water agencies during past droughts. Nevertheless, it is important to note that every drought will evolve differently and that it is not practical to develop a set of hard and fast rules that apply to all situations. The plan should be thought of as a general framework that will need to be adjusted and refined based on actual conditions.

Early in the planning process, staff and the Water Commission developed a set of principles to guide the water shortage planning process. These principles are as follows:

- **Shared contribution.** All customers will be asked to save their share in order to meet necessary reduction goals during water shortages.
- **Reduce non-essential uses first.** The plan concentrates on the elimination of non-essential water uses and on outdoor reductions, and gives the highest priority to essential health and safety uses.
- **Preserve jobs and protect the local economy.** The plan minimizes actions that would have substantial impact on the community's economy and provides large users the flexibility to determine their own reduction strategies within a water budget.
- **Existing conservation measures recognized.** Customers that have already implemented water conservation measures are acknowledged to have less potential for reduction and should not be penalized for conserving.

- **Communication at every stage.** A public information campaign at every level of shortage is essential for customer preparation and will encourage confidence in the City's ability to respond to water shortages.
- **Public participation.** Public participation in the development and implementation of the plan will help to ensure fairness, encourage cooperation, and facilitate implementation and with demand reduction measures in times of shortage.

The final [Water Shortage Contingency Plan](#) was adopted by resolution of the City Council of the City of Santa Cruz in March 2009 as an amendment to the City's Urban Water Management Plan (Appendix Q), and is adopted herein by reference. Subsequently, the City Council adopted an ordinance implementing the water shortage regulations and restrictions contained in the plan ([Santa Cruz Municipal Code Chapter 16.01](#), Appendix R).

Portions of the City's Water Shortage Contingency Plan have since been published and highlighted by the American Water Works Association as an example of a model staged demand reduction program in its new Manual of Water Supply Practices, M60: *Drought Preparedness and Response* (AWWA, 2011).

8.4 Assessing Water Supply and Demand

Rainfall, runoff, reservoir storage, and water year classification are the key hydrologic indicators used by the City to evaluate water conditions. This section of the plan describes these factors affecting the City's water supply and discusses the forecasting process and management considerations used in dry years to determine whether a water shortage is expected for the year ahead and how much water use must be cut back systemwide in response.

In Santa Cruz, a water shortage occurs when the combination of low surface flows in the coast and river sources and depleted surface water storage in Loch Lomond Reservoir reduces the available supply to a level that cannot support existing demand.

After an unusually dry winter or period of consecutive dry years, when a lack of supply appears possible, the Water Department undertakes an analysis to determine whether water supplies will be deficient relative to estimated water needs for the coming dry season. This analysis involves first comparing projected water supply and demand on a monthly basis, assuming no restriction on water use, to forecast the end of season water level and storage volume in Loch Lomond Reservoir. The Department then evaluates whether the amount of carryover storage in Loch Lomond at the end of the

year will be sufficient to meet essential health and safety needs in case the dry weather pattern continues into the following year. If this analysis shows that Loch Lomond Reservoir would be depleted to a dangerously low level, then a decision is made regarding how much reservoir water is available to use in the current year and how much should be banked as a safeguard against the possibility of another dry year. The amount of cutback in demand needed to reduce the rate of reservoir depletion and end the year at a safer level of storage is then determined. If necessary, cutbacks would go into effect in late April/early May and span the entire dry season through late October. A hypothetical situation is provided in the full plan to illustrate this decision-making process.

There is no one single criterion, trigger, or definition that is used to determine if a water shortage exists. The determination of a shortfall involves consideration of all the parameters mentioned previously, as well as expected system demand.

The degree of shortage is normally defined as the supply deficiency in relation to normal water use over a given period of time, and expressed as a percentage. For example, a 25 percent shortage means the City has one-quarter less water supply available than what is normally used during the seven-month long dry season.

8.5 Five Stage Water Shortage Plan

The updated Water Shortage Contingency Plan uses a staged approach that classifies a shortage event into one of five levels spanning a range from less than 5 percent up to 50 percent (Table 8-2).

Table 8-2. Five Stage Structure to Water Shortage Contingency Plan

Stage	Magnitude of Water Shortage	Stage Title
1	0-5%	Water Shortage Alert
2	5-15%	Water Shortage Warning
3	15-25%	Water Shortage Emergency
4	25-35%	Severe Water Shortage Emergency
5	35-50%	Critical Water Shortage Emergency

The overall concept is that water shortages of different magnitudes require different measures to overcome the deficiency. Because there is so little the City can do in the

short run to increase the supply of water, the focus of this plan is primarily on measures that reduce demand. Each stage includes a set of demand reduction measures that become progressively more stringent as the shortage condition escalates. Normally, only one of these five stages would be put into effect early in the year at the recommendation of the Water Director and remain in force for the entire dry season.

There is an important distinction between Stages 1 and 2, designated above in shades of yellow, and the upper three stages. The lower two stages represent a level of curtailment that is envisioned as being necessary to balance water supply and demand from time to time under the City's Integrated Water Plan. Shortages of 15 percent or less, while inconvenient, do not directly threaten public safety or pose undue economic impact. The upper three stages (3-5) are characterized as emergency water shortages since they result in more widespread hardships being felt throughout the community, may threaten public health and welfare, and cause more economic harm. The intent of the City's Integrated Water Plan, however, is to limit future water shortages to no more than more than 15 percent.

8.6 Demand Reduction Program

The City's strategy for dealing with water shortages of all levels involves the following four interrelated components:

1. An allocation system to establish reduction goals for different customer groups
2. Demand reduction measures
3. Publicity and communications
4. Operating actions

These four components are summarized below.

8.6.1 Allocation System

A fundamental issue any water supplier faces in managing a water shortage involves the allocation of water and how to distribute the available supply among customer categories when supplies fall short. In the process of updating this plan, various options and alternatives were reviewed and a priority-based allocation system was selected. This allocation system produces specific demand reduction goals for each major customer category at various levels of shortfall based on the unique usage characteristics of each customer category.

Customer reduction goals for all but the first stage were developed by evaluating the composition of demand for each major group and dividing it into three usage priorities. These priorities are, from highest to lowest, 1) health/safety, i.e., all domestic and sanitary uses, 2) business and industrial uses and, 3) irrigation and other outdoor uses). Normal demands were then scaled back in accordance with the schedule presented in Table 8-3.

Table 8-3. Reduction in Water Delivery by Usage Priority
(Percent of normal deliveries)

Stage	Magnitude of Water Shortage:	Health/Safety	Business	Irrigation
2	15%	95	95	64
3	25%	95	90	34
4	35%	90	85	12
5	50%	75	67	0

In essence, this allocation system strives to balance available supplies in times of drought as much as possible through cutbacks in outdoor water use. At each level of shortfall, public health and sanitation usage is afforded the highest priority by cutting back on interior usage the least. The importance of water in protecting the City's employment base is also acknowledged through proportionately modest cutbacks to the commercial sector as compared to the overall system shortfall. Irrigation and other outdoor uses are cut back the most. The larger the water shortage, the greater the cutbacks, but this same order of priorities is maintained throughout the range of potential shortages.

The heavy reliance on outdoor use reductions makes sense, both from a water system perspective because it reduces peak demands, which is important to preserving storage in Loch Lomond Reservoir, and from a public health and welfare perspective, because irrigation and other outdoor uses are the most discretionary of all uses when drinking water is in short supply. It also makes sense from an operational perspective because outdoor water use cutback can be achieved relatively quickly. From a legal perspective, this allocation system is consistent with the priorities and requirements of Water Code section 354. The resulting water supply allocation and customer reduction goals are presented in Table 8-4.

Table 8-4. Water Supply Allocation and Customer Reduction Goals

	No Deficiency		Stage 2 15% Deficiency		Stage 3 25% Deficiency		Stage 4 35% Deficiency		Stage 5 50% Deficiency	
	Delivery		Delivery		Delivery		Delivery		Delivery	
Normal Peak Season Demand = 2,473 mil gal	%	Volume (mil gal)	%	Volume (mil gal)	%	Volume (mil gal)	%	Volume (mil gal)	%	Volume (mil gal)
Single Family Residential	100	1,031	84%	864	73%	753	62%	639	48%	495
Multiple Residential	100	524	87%	454	78%	411	69%	361	55%	287
Business	100	438	95%	416	92%	402	87%	381	70%	307
UC Santa Cruz	100	132	85%	113	76%	100	66%	87	52%	68
Other Industrial	100	23	95%	22	90%	21	85%	20	67%	15
Municipal	100	48	76%	36	57%	27	41%	20	28%	14
Irrigation	100	110	64%	70	34%	37	12%	13	0%	0
Golf Course Irrigation	100	106	73%	78	51%	54	34%	36	20%	21
Coast Agriculture	100	59	95%	56	90%	53	85%	50	67%	40
Other	100	2	95%	2	90%	2	50%	1	50%	1
Total	100	2,473	85%	2,111	75%	1,861	65%	1,607	50%	1,247
Demand Reduction %, Million gallons	0	0	15%	-362	25%	-612	35%	-866	50%	-1,226

8.6.2 Demand Reduction Measures/Mandatory Prohibitions

The City's Water Shortage Contingency Plan uses a combination of voluntary and mandatory demand reduction measures, which vary depending on level of cutback. As mentioned earlier, the regulations against water waste are in effect in Santa Cruz on a permanent basis. Once a water shortage is declared, however, enforcement of this ordinance is increased and enhanced by the use of fines.

The primary demand reduction measures used in **Stage 1** are to restrict all landscape irrigation to certain hours of the day and to prohibit uses defined as non-essential.

The main approach to reducing water use in **Stage 2** involves expanding mandatory water restrictions and limiting landscape irrigation to specified days, times, and durations. Large landscape users are required to adhere to water budgets.

A **Stage 3** water shortage constitutes an emergency situation. The three primary measures to meet this emergency reduction goal are 1) residential water rationing, 2) mandatory water shortage signage in all commercial buildings, and 3) reduced water budgets for large landscapes. Single family residential customers are rationed using a hybrid approach that provides a base allocation for a family of four and an additional amount per person for larger households. Multi-family residential accounts are rationed based on the number of dwelling units at an account.

A **Stage 4** water shortage requires expanding water rationing to cover all water customers, including business, and reducing residential allocations. At this severe level of shortage, only minimal water is available for outdoor purposes.

Stage 5 represents an extraordinary crisis threatening health, safety, and security of the community. It would involve reduced rationing levels for all customers and a ban on outdoor uses to cut back normal water use by half.

A summary of the demand reduction methods and mandatory prohibitions against specific water use practices is provided in Table 8-5.

8.6.3 Publicity and Communications

Effective communication is essential to the success of any water shortage contingency plan in achieving the desired water use reductions. All customers need to be adequately

informed about water supply conditions, understand the need to conserve, and know what actions they are being requested or required to take to mitigate the shortage. The full Water Shortage Contingency Plan articulates the City's communications strategy, identifies the main customers and groups that need to be kept updated, advised, and informed, and outlines various communication and public outreach measures to employ in a water shortage. The plan also provides prepared public statements for each of the 5 stages that are intended to help communications stay on message and set the tone for subsequent communications through the duration of the incident.

8.6.4 Operating Actions

The City's Water Shortage Contingency Plan outlines the added responsibilities and internal actions taken Water Department when a water shortage arises. Many represent increased costs to the Department for additional personnel, services, and supplies. An important initial step is to designate a working group consisting of the Water Director and senior staff to lead and manage the Department's internal and external water shortage response. The Water Department then must mobilize the necessary personnel, resources, and equipment to undertake the various activities that are critical to implementing an effective response. These initial actions may include, among other things:

- Establishing water production budgets
- Coordinating with other city departments and affected public agencies
- Establishing a public communications program to publicize use restrictions and to engage and involve the community and key water-using sectors in curtailing their demand
- Ensuring adequate staff and training to effectively respond to customer inquiries and enforce water shortage regulations
- Adapting utility billing format and database capabilities
- Expanding water conservation assistance, outreach, and education
- Instituting a system for processing exception requests and appeals
- Addressing policy issues and updating status with decision makers
- Implementing monitoring mechanisms to track actual usage and measure performance

A summary of these key operating and communications actions is provided in Table 8-5.

Table 8-5. Summary of Demand Reduction Actions and Measures

Water Shortage Condition	Key Water Department Communication and Operating Actions	Customer Demand Reduction Measures
<p>Stage 1: Water Shortage Alert (0-5%)</p>	<ul style="list-style-type: none"> • Initiate public information and advertising campaign • Publicize suggestions and requirements to reduce water use • Adopt water shortage ordinance prohibiting nonessential uses • Step up enforcement of water waste • Coordinate conservation actions with other City Departments, green industry 	<ul style="list-style-type: none"> • Voluntary water conservation requested of all customers • Adhere to water waste ordinance • Landscape irrigation restricted to early morning and evening • Non-essential water uses banned • Shutoff nozzles on all hoses used for any purpose • Encourage conversion to drip, low volume irrigation
<p>Stage 2: Water Shortage Warning (5-15%)</p>	<ul style="list-style-type: none"> • Intensify public information campaign • Send direct notices to all customers • Establish conservation hotline • Conduct workshops on large landscape requirements • Optimize existing water sources; intensify system leak detection and repair; suspend flushing • Increase water waste patrol • Convene and staff appeals board 	<ul style="list-style-type: none"> • Continue all Stage 1 measures • Landscape irrigation restricted to designated watering days and times • Require large landscapes to adhere to water budgets • Prohibit exterior washing of structures • Require large users to audit premises and repair leaks • Encourage regular household meter reading and leak detection
<p>Stage 3: Emergency Water Shortage (15-25%)</p>	<ul style="list-style-type: none"> • Expand, intensify public information campaign • Provide regular media briefings; publish weekly consumption reports • Modify utility billing system and bill format to accommodate residential rationing, add penalty rates • Convert outside-City customers to monthly billing • Hire additional temporary staff in customer service, conservation, and water distribution • Give advance notice of possible moratorium on new connections if shortage continues 	<ul style="list-style-type: none"> • Institute water rationing for residential customers • Reduce water budgets for large landscapes • Require all commercial customers to prominently display “save water” signage and develop conservation plans • Maintain restrictions on exterior washing • Continue to promote regular household meter reading and leak detection
<p>Stage 4: Severe Water Shortage Emergency (25-35%)</p>	<ul style="list-style-type: none"> • Contract with advertising agency to carry out major publicity campaign • Continue to provide regular media briefings • Open centralized drought information center • Promote gray water use to save landscaping • Scale up appeals staff and frequency of hearings • Expand water waste enforcement to 24/7 • Develop strategy to mitigate revenue losses and plan for continuing/escalating shortage 	<ul style="list-style-type: none"> • Reduce residential water allocations • Institute water rationing for commercial customers • Minimal water budgets for large landscape customers • Prohibit turf irrigation, installation in new development • Prohibition on on-site vehicle washing • Rescind hydrant and bulk water permits
<p>Stage 5: Critical Water Shortage Emergency (35-50%)</p>	<ul style="list-style-type: none"> • Continue all previous actions • Implement crisis communications plan and campaign • Activate emergency notification lists • Coordinate with CA Department of Public Health regarding water quality, public health issues and with law enforcement and other emergency response agencies to address enforcement challenges • Continue water waster enforcement 24/7 	<ul style="list-style-type: none"> • Further reduce residential water allocations • Reduce commercial water allocations • Prohibit outdoor irrigation • No water for recreational purposes, close pools • Continue all measures initiated in prior stages as appropriate

8.6.5 Enforcement, Exceptions, and Appeals

The City's water shortage regulations and restrictions ordinance contains provisions for enforcing water use rules and regulations, and processes for issuing exceptions and hearing appeals. Administrative enforcement methods include the following:

Administrative Penalties These penalties are for failure to comply with water waste prohibitions and mandatory water use restrictions and are applied to the customer's next utility bill. The object of imposing increasingly significant penalties is to assure compliance by creating a meaningful disincentive to commit future code violations. When a violation occurs, the Water Department first provides a written notice and give the customer an opportunity to correct the situation. Additional violations are penalized as follows:

2nd Violation \$100
 3rd Violation \$250
 4th Violation \$500

Large users (defined as using over a million gallons per year) are penalized at triple the amounts listed above.

Excess Water Use Penalties These penalties are assessed when a customer uses more water in a given billing cycle that their rationing allocation provides. Excess use penalties are in addition to ordinary water consumption charges, as follows

1% to 10% over customer rationing allotment:	\$25.00/CCF
More than 10% over customer rationing allotment:	\$50.00/CCF

In addition to any administrative penalties and excess water use penalties, a flow restrictor and/or discontinuation of service may be ordered for willful violations of the City's water shortage regulations and restrictions ordinance.

The ordinance contains an exception process and that allows the Water Department, upon making specified findings, to provide for special or exceptional circumstances that otherwise would create undue hardship for an individual customer or class of customers. It also allows any water service customer who considers an enforcement action to have been erroneously undertaken to appeal their case before a City Council appointed ad hoc Drought Appeals Board. The Appeals Board considers the evidence

presented by the customer and decides whether to uphold the enforcement action or to provide relief.

8.7 Implementation

The final section of the City’s Water Shortage Contingency Plan describes the process and issues associated with implementing the plan. The reader is referred to the full plan for a complete discussion of these issues. The most important subjects are covered briefly below.

8.7.1 Timeline for Declaring Water Shortage

The timeline showing when the City evaluates water supply conditions and, if necessary, declares a water shortage is presented in Table 8-1 below.

Table 8-6. Calendar for Declaring Water Shortage

Target Date	Action
Months of Oct -Dec	Monitor rainfall, reservoir level, and runoff amounts
Late January	Prepare written status report on water supply conditions
Early February	Present initial estimate of water supply availability for year ahead
Early March	Present revised estimate of water supply availability for year ahead
Mid-March	SCWD announces existence of water shortage (if applicable)
Mid to late March	SCWD determines monthly water production budget and need for voluntary or mandatory response.
Early April	Present shortage response recommendation to Water Commission; notice of public hearing published
Mid-April	City Council formally declares a water shortage, adopts emergency ordinance
Mid to late April	Water shortage regulations become effective

8.7.2 Process for Declaring Water Shortage

Once the water shortage condition has been defined (as soon as reasonably certain), recommendations regarding water shortage rules and regulations consistent with this contingency plan are discussed with the City Water Commission. Monthly Water Commission meetings serve as a public forum for discussing water conditions and for hearing issues associated with implementation of the water shortage ordinance throughout the entire duration of the water shortage event.

Following consideration by the Water Commission, a declaration of water shortage is made by a resolution of the City Council. The legal requirements for such action are covered in Section 350 et seq. of the California Water Code. The code requires the following process be followed:

- That City Council hold a public hearing on the matter;
- That the public hearing be properly noticed (minimum of publishing once in newspaper at least seven days prior to the date of the hearing);
- Upon determining and declaring the existence of a water shortage, City Council may then adopt regulations and restrictions governing the use and delivery of water.

In accordance with Municipal Code section 16.04.480, rules adopted by the City Council establishing water use regulations become effective immediately after their publication in a newspaper of general circulation published in the City of Santa Cruz.

8.7.3 Effect of Water Shortages on Revenues and Expenditures

One of the negative consequences of using demand reduction to deal with water shortages is the corresponding reduction in revenue that occurs to the City's Water Fund as a result of reduced water sales. The full plan provides an analysis of the magnitude of revenue losses that the Water Fund might experience for each of the five stages, based on 2007 revenues of just over \$22 million, which is comparable to revenues received in the most recent 2011 fiscal year.

The analysis assumes the "ready-to-serve" or fixed monthly service charge that is based on meter size would remain unaffected while the volumetric portion of the Department's revenue derived from water sales would vary by customer class in accordance with the allocation presented in Table 8-4 over the seven month period in which water shortage regulations are likely to be in effect.

The analysis shows revenue losses ranging from just under \$0.6 million in a 5 percent water shortage situation to almost \$5.8 million in a critical 50 percent water shortage. Compared to 2007 revenues of just over \$22 million, the Department's net revenue would be reduced to approximately \$21.5 million in Stage 1 to less than \$16.4 million in Stage 5. These estimates of losses were considered ballpark figures only and probably underestimate the problem. Actual losses would be different for the following reasons:

- The spreadsheet did not model the effect of tiered pricing in the single family residential category, which would exacerbate revenue losses from this group;

- It is unlikely that system water use would immediately recover to normal levels in the months following a period of curtailment as modeled, thereby further depressing income;
- The table above does not include added operating costs of staff, equipment, and materials related to the water shortage response.

On the other hand, the time of year in which regulations would take effect includes parts of two fiscal years, so the full effect of revenue losses would not impact the Department's annual budget to such a large degree. In addition, there would be relatively minor cost savings associated with reduced power and chemical usage at the Graham Hill water treatment plant, ranging from <\$0.1 million in Stage 1 to about \$0.4 million in Stage 5. Finally, some of the revenue loss would be offset by penalty and/or excess use fees.

Whatever the situation, one element of implementing this Water Shortage Contingency plan involves examining the Water Department's proposed budget for the coming year and recommending action(s) to lessen or overcome the revenue shortfall. Options include the following:

- Tapping into the Department's Rate Stabilization Fund (currently \$2.4 million)
- Deferring planned capital improvements
- Drawing down the available Water Fund balance
- Considering possible rate adjustments or surcharges

On the expenditure side, the major expense of implementing the water shortage plan identified was for added personnel costs for temporary field and office positions, which were estimated to range from approximately \$100,000 in Stage 1 to \$600,000 in Stage 5.

8.7.4 Mechanism for Determining Actual Reductions

Under normal water supply conditions, water production and gross consumption are recorded daily and monthly by treatment plant operators and reported to the Production Superintendent. Metered water consumption is reported on a monthly basis through automated sales reports generated by the utility billing system.

During a water shortage, a monthly production forecast and budget are developed for each source of supply. Actual production and the lake level are closely monitored on a

daily and weekly basis to verify that the budgeted goals are being met. Consumption by large users is monitored and reported on a frequent basis. In severe stages of a water shortage, production and consumption data would be evaluated daily and the status reported to the Water Director's office. If the trend in consumption is such that the rate of drawdown at Loch Lomond is greater than anticipated, the City Manager and Council are notified so that corrective action (such as increased publicity and enforcement or consideration of declaring the next higher stage) can be taken.

8.8 Documentation of 2009 Water Shortage

In the two years preceding the development of the City's Water Shortage Contingency Plan, water conditions throughout the state of California had fallen below average, and water resources in some areas were already stressed by drought. Then, in 2009, after a third consecutive year of below normal rainfall and runoff, it became necessary to put the contingency plan into immediate effect after its review and adoption by City Council.

As it turned out, the water shortage of 2009 was equal to the 15 percent water reduction goal envisioned in the City's Integrated Water Plan. Accordingly, the 2009 water shortage was important not only as an enactment of the newly created Water Shortage Contingency Plan, but also as a test of a core idea underpinning the City's Integrated Water Plan, namely that the community could achieve and would tolerate periodic cutbacks in water use by up to 15 percent.

In many ways, the effort to reduce customer water use during 2009 can be considered a success. Consumption reduction goals were achieved. The overwhelming majority of the City's customer complied with water restrictions. Reservoir storage was preserved. Little if any, lasting damage to public and private landscapes was done. In the end, water conditions improved substantially in 2010. But had it not, the water saved from restrictions enacted in 2009 would have meant a good deal less hardship dealing with a potentially 4th dry year.

A key ingredient to this success was the public's understanding, awareness, and belief that the City was confronted with a true water shortage problem. Media coverage of water problems across California reinforced the situation. Without that sense of a real and imminent problem, it's likely the level of cooperation and willingness demonstrated by the community in making changes they did would have been considerably lower.

Much progress was made with putting enforcement systems, procedures, and tools in place that were not in place prior to 2009 and will help in future events. Even so, there

were numerous lessons learned from this experience and several areas where improvements could be made to better manage water shortages in the future.

Afterwards, Water Department staff prepared a report to document the response and compile records for future reference. This report, entitled: [The 2009 Water Shortage: An Evaluation of Water Management Strategies, Actions, and Results](#) evaluates which aspects of the plan succeeded and which didn't, and why, and makes recommendations and refinements to the plan for the next time a water shortage occurs.

8.9 Estimate of Minimum Supply for Next Three Years

Water Code section 10632 (b) requires water suppliers to provide:

“An estimate of the minimum water supply available during each of the next three years based on the driest three year sequence for the agency’s water supply.”

The City’s operations model was used to develop two hypothetical scenarios for the next three water years, 2012 through 2014. The hydrologic sequence assumes that conditions for water year 2012 are similar to that experienced in 2007, a recent critically dry year. For 2013 and 2014, water conditions were assumed to similar to those experienced in the 1976-77 drought. The demand condition in both scenarios was set at approximately 3.5 billion gallons per year. Each scenario assumes that Loch Lomond Reservoir begins at full capacity on April 1, 2012. The difference between the two scenarios is that one model run is operated with no HCP in-stream flow requirements. The other is operated assuming Tier 2 in-stream flow requirements. Scenarios were run both ways because, while there is no agreement at this time about necessary releases, Tier 2 flows could be required in the not too distant future. Results for minimum water supply volumes available during each of the next three years as determined by the model, and corresponding peak season water shortages, are presented in Table 8-7.

Table 8-7. Estimate of Minimum Supply for Next Three Years

Water Year	2012		2013		2104	
Hydrologic Year	2007		1976		1977	
In-Stream Flow Requirement	No HCP	Tier 2	No HCP	Tier 2	No HCP	Tier 2
Total Water Available - net (mgy)	3,500	3,520	3,320	3,110	3,280	2,870
Peak Season water Shortage (%)	0%	0%	5%	19%	13%	33%
End of Season Lake Level (bil gal)	2.3	2.3	1.8	1.7	1.1	1.1

While modeled results reflect an operating logic for the system, the model cannot reflect the human judgment and decisions that would actually be made in the face of uncertain and evolving dry weather conditions. Primarily, they reveal the effect in-stream flow releases could have on system reliability, under relatively low, near-term demand conditions. In all likelihood, were the City to face a second dry year like 1976 following a year like 2007, the Department would call for earlier and deeper cutbacks to preserve storage in case of subsequent dry years, as is described in the full Water Shortage Contingency Plan. In fact, the equivalent of Stage 1 water restrictions actually were invoked by the Department in 2007 as a precautionary measure under similar demand conditions, even though the model technically does not detect or produce a water shortage in the first year.

8.10 Catastrophic Interruption of Water Supplies

Water Code section 10632 (c) requires water suppliers to:

“Describe the actions to be undertaken to prepare for, and implement during, a catastrophic interruption of water supplies, including, but not limited to a regional power outage,, an earthquake, or other disaster.”

The City plans for and responds to emergency incidents, including floods, earthquakes, fires, and hazardous materials incidents in accordance with the Santa Cruz County Operational Area Memorandum of Understanding (MOU). The MOU ratifies local government agreements to follow the Standardized Emergency Management System or SEMS, as mandated under California law. The City maintains an Emergency Management Plan, which defines and describes the emergency management organization and guides the response of appropriate personnel to a major emergency. The City Manager, functioning as the City’s Director of Emergency Services, would coordinate the emergency response to maintain water delivery and/or restore service as necessary. The Emergency Management Plan also addresses the integration and coordination with other government agencies and levels when required.

The Water Department maintains a mutual assistance agreement with other water agencies through the Water/Wastewater Agency Response Network (WARN) to share equipment, personnel, and supplies in times of an emergency. The City is a within the California Office of Emergency Services Coastal Region II, which includes the counties in the San Francisco Bay region and northern California coast.

The Water Department has its own **General Emergency Plan and Emergency Response Plan for Terrorist Activity and Natural Disasters** in accordance with state and federal laws. This document sets forth the primary objectives of the Department in an emergency as follows:

- Maintain water service for domestic and firefighting purposes,
- Protect the water supply from possible contamination,
- Control the loss of water, and
- Keep the public informed

The plan outlines the roles and responsibilities of key Departmental personnel during an emergency at both the City Emergency Operations Center and Water Department Operations Center. It also describes general actions to be taken to 1) assess situation status and extent of damage to the water system, 2) prevent contamination and loss of water, and 3) restore water service in response to the following types of emergencies:

- Earthquake
- Tsunami
- Flood
- Fire
- Suspected Contamination of Water Supply
- Civil Disorder
- Power Outage
- Treatment Plant Failure
- Damage to Distribution Storage Reservoirs or Booster Pumping Station
- Telecommunications Failure

The plan contains an emergency water rationing plan intended to preserve treated water supplies in the event a catastrophe results in impairment of the water system. The emergency rationing plan has two stages, which are defined as follows:

Serious shortage: This condition exists when the system is unable to meet normal demand, but can supply enough water for basic public health and safety needs. In this situation, not taking swift action to ration water could jeopardize available water in storage, or could leave the City vulnerable in the event of further outages.

Critical shortage: This condition exists when production facilities are rendered incapable of meeting 50% or less of normal daily production levels and the current rate

of consumption poses an immediate threat of draining Bay Street reservoir or other storage tank.

The restrictions that would be instituted in a serious or critical shortage are summarized in Table 8-8.

Table 8-8. Emergency Water Rationing Plan

Serious Shortage	
<i>Prohibited Uses:</i>	<i>Permitted Uses:</i>
<ol style="list-style-type: none"> 1. Watering lawns, gardens or landscaping 2. Washing cars, boats, building exteriors 3. Washing sidewalks, driveways, or any exterior surfaces 4. No outdoor use for any reason 5. Car washes closed 6. Watering plants at nurseries, garden centers 7. Filling of swimming pools, hot tubs, decorative pools, or fountains (must be turned off) 8. Public showers closed 	<ol style="list-style-type: none"> 1. Normal domestic uses: drinking, cooking (paper plates and plastic utensils requested) 2. Toilet flushing, only when necessary 3. Limit showers to three minutes 4. Bathing only if absolutely necessary (no more than half full) 5. Minimize clothes and dish washing
Critical Shortage	
<i>Prohibited Uses:</i>	<i>Permitted Uses:</i>
<ol style="list-style-type: none"> 1. Outdoor water use for any reason (garden, landscape, car washing, cleaning, maintenance) 2. Clothes washing and commercial laundering, except for health reasons 3. Janitorial cleaning 4. Businesses and institutions that use water in their operations may be forced to close or restrict operations: <ul style="list-style-type: none"> - Restaurants, bars, and coffee shops - Laundromats - Public and Private Schools - Manufacturing - Gyms and health spas - Beauty salons and barber shops 5. No water for construction 6. No water for crop irrigation 	<ol style="list-style-type: none"> 1. Water limited to health and safety only: drinking and cooking (paper plates and plastic utensils required) 2. Toilet flushing for solid waste only 3. Shower/bathing should be limited to every other day 4. Use water only when absolutely necessary

The City has four portable auxiliary generators to run booster pumps in case of an extended power outage. In addition, the treatment plant and major pump stations have stationary electrical generators as a stand-by source of power in case of a local or regional power outage.

A separate Emergency Response and Public Notification Plan was developed in 2007 in anticipation of the deconstruction of Bay Street Reservoir. As part of this plan, communication and standard public notification procedures were put in place in the event a water emergency arose. This plan included developing the capability to trigger an automated call-out notification system (Reverse 911) to rapidly disseminate a generalized water emergency warning throughout the Santa Cruz water service area.

Finally, Water Department has separate earthquake response procedures that outline responsibilities for inspection and reporting the status of critical structures, including Newell Creek Dam, Bay Street Reservoir, and other major water production facilities following an earthquake.