

Water Convention Alt #	Alternative Name from Master List	Description	Focus Area	Water Source(s)	Where to store the water	Intended use(s)	Additional treatment required	Additional infrastructure	Outstanding issues
WCA-01	Markowitz: Landscaping, Capture, Re-use	Use graywater for your landscape; minimize irrigation requirements; minimize lawns/design in patios. Rainwater to go into the house/building for domestic, non-potable use.	Demand	Decentralized (rainwater, graywater)	Rainwater catchments	Irrigation (non-potable)	No	No	
WCA-02	SCDA: Conservation Building Codes	Form a working group to consider building code revisions that include onsite water systems. These would go that go beyond the California Building Code, so that new buildings are highly water-efficient and can capture and re-use water onsite. The City can pass an ordinance requiring efficient fixtures in existing buildings.	Demand	Conservation (mandated)	NA	Irrigation (non-potable)	No	No	
WCA-03	SCDA: Water-Neutral Development	Implement a water demand offset program, where developers fund conservation retrofits elsewhere in the system to offset the new demand for water created by the development. The City needs to prevent growth from eroding our drought security by adopting a water-neutral growth policy in which developers fund conservation programs that aren't already funded by ratepayers.	Demand	Conservation (mandated)	NA	Potable or nonpotable	No	No	
WCA-04	WaterSmart: Home Water Reports	The software organizes water use information to help engage customers, and allows customer-specific responses by staff. WaterSmart software analyzes billing data to disaggregate indoor and outdoor usage, lot size, home characteristics, location, the impact of weather and seasons, and any efficiency measures installed as part of a conservation program. Comparisons are made with other similar customers but no physical measures or incentives are delivered.	Demand	Conservation (voluntary)	NA	Potable or nonpotable	No	No	
WCA-05	Bevirt: North Coast Water	This alternative for initial comparison uses only the Liddell quarry which would hold about 650 million gallons (MG) since its construction would not require building a dam. The San Vicente site was dropped since the San Mateo Peninsula Open Space Trust and the Sempervivens Fund have acquired the site and initiated creation of a conservation easement over the site to prevent future development. If the City withdrew stored water over a 3-year drought cycle, production would be about 200 MG annually after allowing for evaporation and leakage losses.	Storage	Winter flows	New surface reservoirs	Potable or nonpotable	No	Pumping stations, Ranney collectors, pipeline	Water rights (new diversion location from which to fill the reservoir, routing of fill pipeline), geotechnical and construction issues associated with installing a liner on steep slopes over a porous karst formation, preparation and approval of environmental documents, California Department of Fish and Wildlife (CDFW) and National Marine Fisheries Service (NMFS) approvals for water diversions from streams with salmonoid populations, and agreements with the landowner about ownership and operations.
WCA-06	McKinney: Expanded Treatment Capacity	This alternative for initial comparison would add a new 14-mgd water treatment plant (WTP) (pretreatment for turbidity control and membrane filtration) near the Tait Street Diversion to produce treated water that would be piped directly into the distribution system. The write up for this alternative indicates that the alternative would allow an annual water diversion increase of about 560 MG.	Supply	Winter flows	Loch Lomond, Other	Potable	Yes	Pumping station	determine the final treatment train (MF would need pretreatment ahead of MF for elevated SLR turbidity concentration), preparation and approval of environmental documents, determination if water rights and diversion permits would need modifications, and development of a plan to store and use diverted water beneficially. If the City would have excess water during normal or wet years, it might transfer extra water to Soquel Creek Water District (SqCWD) and/or Scotts Valley Water District (SVWD) but doing so would require agreements with the agencies and likely would trigger water rights permit modifications since the place of use would change.
WCA-07	McKinney: Ranney Collectors on SLR	Use Ranney collectors with a 12.9-mgd capacity (maximum capacity allowed under the current City of Santa Cruz [City] diversion permit), installed near the City's Felton diversion to draw water allocated under the City's existing water rights. Water drawn through the collectors would have greatly reduced turbidity. Much higher water quality would allow continuous refilling of Loch Lomond while also operating the GHWTP. More studies would be required to project increased diversion opportunity, however the increased diversion likely would be somewhat less than about 560 MG annually as projected for McKinney: Expanded Treatment Capacity	Supply	Winter flows	Loch Lomond, GW recharge, other	Potable	No	Ranney collectors	the City would need to conduct additional analyses for available flow, addressing any bypass requirements under the habitat conservation plan. The City would also need to determine its plan to store and use diverted water beneficially. If the City would have excess water during normal or wet years, the City might transfer extra water to Soquel Creek Water District (SqCWD) and/or Scotts Valley Water District (SVWD) but doing so would require agreements with the agencies and likely would trigger water rights permit modifications since the place of use would change.
WCA-08	Paul: (13) The Lochquifer Alternatives	Use treated water sold by the City to Soquel Creek County Water District (SqCWD) during normal and wet years. SqCWD would use the transferred water either for groundwater recharge through seven 250-gallon-per-minute (gpm) recharge wells, for conjunctive use (well field resting) recharge, or both. The City would take more water from its San Lorenzo River and/or Newell Creek diversions, about 2.5 million gallons per day (mgd) or about 915 MG annually, to match the desalination alternative. If recharge occurred continuously for five years, total transferred water would be about 4,600 MG. Facilities would include Ranney collectors at the Felton Diversion, to insure that the Graham Hill Water Treatment Plant (GHWTP) could treat the diverted water continuously. During drought years the City would receive returned water (groundwater) from SqCWD. The City also would pump its Tait Street wells year round since the recharged Purisima aquifer would yield available water without causing seawater intrusion. Potential yield would be 2 mgd from the Live Oak wells and 2.5 mgd from SqCWD; 4.5 mgd total. If the City used these sources for six months, total production, after deducting out a 1-mgd production allowance for the existing wells, would be about 640 MG annually.	Supply	Winter flows	Loch Lomond, GW recharge, other	Potable	No	Pumping stations, Ranney collectors, pipeline	Water rights (modification of place of use), assembling appropriate information to site injection wells, modeling the Purisima aquifer to project better potential performance, and agreement with SqCWD on how the alternative's water would be conveyed, shared and paid for.
WCA-09	Ripley: Reuse for agriculture	produce filtered disinfected effluent (CA Title 22 unrestricted water) from the City Wastewater Treatment Plant (WWTP) at a rate of about 4.3 mgd. The City would pump the effluent north through a new pipeline aligned along the railroad right of way, with turnouts to irrigate up to about 1,300 acres on private land and leased land on properties owned by the California State Parks (CSP) and the United States Bureau of Land Management (BLM). This process is assumed to take place over 180 days per year and total water available for crop irrigation would be about 780 MG. The City would build 12 new 250-gpm extraction wells that discharge into new pipeline that in turn would connect to the existing City North Coast pipeline. The water would combine with diverted surface water from the City North Coast rights, for treatment at the GHWTP. To develop space for new facilities within the WWTP site, the City would need to relocate its Line Maintenance Facility from the WWTP site to a new site on the West Side.	Supply	Wastewater effluent/groundwater	Aquifer	Irrigation (non-potable)	Yes	Line maintenance facility, delivery pipeline, extraction wells, return pipeline, storage reservoir	Legal agreements with CSP, BLM, and property owners and with irrigators, securing the right of way for the new delivery and return pipelines such as along the railroad ROW, geotechnical investigations for well construction, assessment of the groundwater basin to ensure that operation would not adversely affect the groundwater basin, permitting through the California Coastal Commission, preparation and approval of CEQA/NEPA documents (NEPA is included because the project includes BLM land), and location and purchase of new Line Maintenance Facility site.
WCA-10	SCDA: Regional Aquifer Restoration	have the same components as "Paul Lochquifer" but the recharge and return rates would be lower. This alternative would transfer about 800 MG from the City to SqCWD over an extended period but SqCWD would return only about 145 MG to the City during dry years. The City's drought production from its Live Oak wells would increase from 1 mgd to 2 mgd, or about 365 MG. The long-term average approximate production increase appears to be $((145+365)/6.5) = 78$ MG.	Supply	Winter flows	Loch Lomond, GW recharge, other	Exchanges with neighboring systems	No	Pumping stations, Ranney collectors, pipeline	water rights (modification of place of use), assembling appropriate information to site injection wells, modeling the Purisima aquifer to project better potential performance, and agreement with SqCWD on how the alternative's water would be conveyed, shared and paid for.

WCA-36	Aqueous: Desalination (non-membrane)	Build desal with a smaller footprint, less power demand, less capital, no pretreatment, no membranes, high raw water intake. The AQUEOUS System (AQ500K) is NOT a membrane based system, but a closed recycling thermal dynamic system using increasing pressure that reaches significant temperatures causing the molecular level separation of gas, liquids and solids via a multiphase process that is extraordinarily efficient.	Supply	Seawater	Aquifer storage if needed	Potable	?	?	
WCA-37	Brown: Zero-emission Wave Energy	Converts ocean wave energy into zero-emission electricity and desalinated water	Supply	Seawater	Aquifer storage if needed	Potable	?	?	
WCA-38	DewPoint: Atmospheric Water Generation	Dew Point's Water harvesting generators continuously simulate the "Dew Point" thus transforms the limitless water vapor in the air and condenses it into safe, clean water	Supply	Moist air	Storage likely not needed.	Irrigation (non-potable)	No	Yes	
WCA-39	Gargles: Residential Gray-water	Reuse water from showers and bathtubs for sanitation and irrigation	Demand	Decentralized (rainwater, graywater)	NA	Nonpotable	No	No	
WCA-40	Gratz: Recycled Water for Irrigation	use recycled water for irrigation	Supply	Recycled water/groundwater	Storage possibly not needed.	Irrigation (non-potable)	Yes		Line maintenance facility, delivery pipeline, extraction wells, return pipeline, storage reservoir
WCA-41	McGilvray: (1) Recycled Water for Irrigation	Use 30 MG of recycled water per year	Supply	Recycled water	Storage possibly not needed.	Irrigation (non-potable)	Yes		Line maintenance facility, delivery pipeline, extraction wells, return pipeline, storage reservoir
WCA-42	McGilvray: (4,5) Upgrade Water Treatment	Add 2nd pipeline to Loch Lomond. Obtain permission to take water direct from Felton diversion. Use a better settling agent	Supply	Winter flows	Loch Lomond	Potable or nonpotable	Yes		
WCA-43	McGilvray: (6,7) Pipelines Along RR Line	Install on RR right of way Santa Cruz to Watsonville.	Supply	Recycled water	Ag irrigation and/or GW recharge	GW recharge	Yes		
WCA-44	McGilvray: (8) Tertiary Treatment, Re-use	Enlarge tertiary water treatment capacity at Neary Lagoon wastewater treatment plant	Supply	Recycled water	Groundwater	Irrigation (non-potable)	Yes		Line maintenance facility, delivery pipeline, extraction wells, return pipeline, storage reservoir
WCA-45	McKinney: Additional Wells and WTPs	Develop new groundwater resources can diversify the City of Santa Cruz potable water supply. Wells located in the alluvium adjacent to the San Lorenzo River at the Felton Diversion, Coast Pump Station, and Tait Street well field can provide a reduced turbidity supply during periods of high runoff. Wells coupled with satellite water treatment plants in portions of the distribution system where water age affects water quality can increase supply modestly, reduce water waste, and improve quality. Sites for satellite production include the Branciforte service area, Carbonera Tank, Tanner Heights, Harvey West, University service infrastructure, Wilder Ranch, North Coast brackish sources, Lompico Formation on the North Coast, and the North Coast Recirculation Pump Station.	Supply	Groundwater	Groundwater	Potable or nonpotable	Yes		new satellite WTPs
WCA-46	McKinney: Water Reuse	Repurpose existing infrastructure to effectively deliver Reclaimed Water from the City of Santa Cruz's Wastewater Treatment Facility (SCWWTFF) to augment the SLR. Several alternatives, including expanding reclaimed water filtration capacity at WWTP, building a new tertiary treatment plant off site a Coast Pump Station or Bay Street reservoir, or Build a Tertiary water main up Bay Street to the Bay Street Reservoir and tie into existing coast main or repurpose Scotts Valley WWTP effluent main for reclaimed water supply line.	Supply	Recycled water		Stream augmentation, potable	Yes		Line maintenance facility, delivery pipeline, extraction wells, return pipeline, storage reservoir
WCA-47	Paul: (11) Multi-purpose Settling Ponds	Make use of our existing diversion facilities at Felton and/or Tait Street by using the multipurpose settling pond to remove turbidity.	Supply	Winter flows	GW recharge, other	GW recharge	No		Settling pond
WCA-48	Paul: (12) Diversion Alternatives	To capture turbid winter flows, use diversions such as ranney collectors, infiltration galleries, or casing path wells	Supply	Winter flows	Loch Lomond, GW recharge, other		Yes		Possibly
WCA-49	Paul: (14) Upgrade Water Intertie	Expand existing 6" SCWD/SqCWD intertie now by increasing pipe diameter to 18" for a short distance; get emergency or temporary permit; install a bi-directional variable-speed lowpressure inline pump to control water transfer capacity of at least 2000 AFY; capture an extra 300 to 500 AFY this winter. Re-apply for rights each winter during tide-over	Supply	Winter flows					
WCA-50	Paul: (15) Cross-County Pipeline	Cross-County Pipeline conveys <6000 AFY of raw water to Loch Lomond from some or all streams between the San Lorenzo River just above Boulder Creek and Soquel Creek, inclusive, and possibly Bear Creek and Aptos Creek. It includes diversions from some or all of said streams, and can augment any of the streams when needed for fish habitat. Diversion equipment would inherently filter out turbidity. The Pipeline would store winter water in Loch Lomond, then distribute Loch water throughout the year to the participating aquifer-dependent water districts, who in turn can rest their wells to recharge aquifers very quickly. A new water treatment plant would be built in the vicinity of the Loch or Scotts Valley to serve participating water districts primarily by gravity, possibly generating hydroelectricity in the process	Supply	Winter flows	Loch Lomond, GW recharge, other	Stream augmentation, potable	No		New WTP, pipeline, Ranney Collectors (or other diversions)
WCA-51	Paul: (16) Water Looping	pumping water from the bottom of the range to the top of the range to significantly enhance the stream flow in that range of the stream for a few weeks out of the year	Supply			Stream augmentation	No		pipeline
WCA-52	Paul: (17) Detention Tub String	Construct a detention tub string to hold reclaimed water long enough so that it can be treated as potable	Supply	Recycled water	detention tub	Potable			
WCA-53	Paul: (18) Weir Systems	Create a boom in fish populations by raising the water depth by a few inches or feet in crucial segments of streams at times of year crucial for fish. The program would be administered by fish biologists using inexpensive computer-controlled weirs	Supply						
WCA-54	Paul: (19) Stream Relocation	Eco-sensitively re-route a stream to the next canyon, to make an off-stream reservoir out of its original canyon. Uses fish-friendly Ranney collector or infiltration gallery to filter turbidity out of the water being placed in the reservoir, so reservoir will not silt up and its water will be pre-treated, so as to be more pure for dry-season stream augmentation and human use	Supply	Winter flows	New surface reservoirs	Potable	No		Ranney collectors
WCA-55	Paul: (20) SLR Alluvial Plain Wells	Pump alluvial wellwater from Tait Street to Felton in either a water-looping scheme (See Sec. 16) or in a simple effort to stimulate and support fish migration by increasing the flow from Felton to the sea	Supply	Groundwater		Stream augmentation	No		
WCA-56	Paul: (21) Groundwater Rights Mgt	Promote a regional Groundwater Management/Reclamation District to incentivize conservation among private well owners, and to gain their financial participation in groundwater recharge projects	Supply						

		Divert winter water using equipment which would substantially de-turbidify the water by making it filter down through stream beds. The water would come from streams at elevations comparable to or higher than those of Loch Lomond Reservoir, for the reasons stated in the previous paragraph. A new 8 mgd treatment plant near the Loch would insure that when the diverted water is added to the Loch, it meets excellent quality standards. Throughout the year, the new treatment plant would also treat Loch water on its way down to participating agencies, which would shut off their wells and thus let their aquifers recharge very quickly. The name "Loch-Down" originates from how it features water flowing downhill, generating hydroelectricity--instead of consuming energy required to pump uphill, as is done currently from Felton to the Loch. Larger diversions can be achieved without enlarging the treatment plant, but merely by adding a simple buffer pond and/or some pipeline.	Supply	Winter flows			Yes		
WCA-57	Paul: (23) Loch-Down Alternatives		Supply	Winter flows			Yes	Pipeline, Ranney collector	
WCA-58	Paul: (24) Cowell Railroad Pipeline	Construct a pipeline through Henry Cowell State Park along the existing railroad right-of-way, and install a subsurface diversion device such as a Ranney collector at Felton to filter out turbidity, increase capacity and save energy	Supply	Winter flows			Yes		
WCA-59	SCDA: Enhance Existing Infrastructure	City conduct an evaluation of the cost, benefit, feasibility and environmental impact of the following: aquifer recharge with potable water, aquifer recharge on North Coast, adding new treatment facility (possibly at Bay St. Reservoir), wells to tap Santa Margarita Aquifer in Live Oak area, relocate the main San Lorenzo River diversion upstream, accelerate the replacement of old pipes in the distribution system	Supply	Winter flows			?	?	
WCA-60	SCDA: Watershed Restoration	City should conduct a cost/benefit analysis of funding stormwater infiltration projects in groundwater recharge zones City convene a joint effort with Scotts Valley Water District and San Lorenzo Valley Water District to contract with the California Conservation Corps to engage in watershed restoration, including restoration of roads; storm water infiltration projects; and partnering with schools and community groups to do restoration	Supply	Stormwater					
WCA-61	Smallman: Conservation Savings Accounts	Set up conservation savings accounts for water customers to increase the incentive for them to install water saving improvements. This account will accrue money from a percentage of the billing. The water agency shall also apply for grants for this program to help build these accounts	Demand						
WCA-62	Smallman: Recycled Water	Build and Advanced Treated Recycled Water Treatment Plant at the corner of Delaware Avenue and Natural Bridges Drive	Supply	Wastewater effluent		potable or nonpotable	Yes	Treatment plant, pipeline, transmission mains, injection wells	
WCA-63	Smallman: Water Skate Parks	This alternative is similar to the "Storm Quarry Plan", but treats the water immediately to a potable degree, rather storing partially treated water into reservoirs. the potable water would be injected directly into the distribution system, or go to storage facilities replacing water that is normally drafted from the ground water basin	Supply	Stormwater					
WCA-64	Weisz: Water recycling	Treat wastewater effluent to potable drinking standards	Supply	Recycled water		Potable or nonpotable	Yes	Yes	
WCA-65	zNano: Conservation rebate program	Offer a rebate for water efficient technologies and retrofit (WET&R) projects using 3 years of public financing	Demand	Conservation (voluntary)	NA	Potable or nonpotable	No	No	
WCA-66	zNano: On-site Water Re-use	Through rebates, encourage homeowners or businesses to install zNano water treatment appliances to reuse water in the home or business. These appliances help recover waste water	Demand	Decentralized (rainwater, graywater)	NA	nonpotable	No	No	
WCA-67	Tanaka	Convert waste plastic into fuel to provide an energy source for desal							
WCA-68	Program C from the long term conservation master plan	Program C is defined in Table 4 of the MWM TM dated 9/30/2014. It includes a side variety of water conservation/efficiency measures, some mandated, some incentivized through rebates and some using public and customer outreach and/or communication to encouraged changed behavior.	Demand	Conservation (voluntary)	NA	Potable or nonpotable	No	No	
WCA-69	SCWD: Peak season reductions – 10%, 25% and 50%	Develop programs to decrease peak season demands through peak reduction or peak-demand shifting	Demand	Conservation (mandated/voluntary)	NA	Potable or nonpotable	No	No	
WCA-70	Home Water Recycling	Use commercially produced recycling systems in new residential construction and possibly retrofitted into existing residential units. The units would treated gray water to supply treated for toilet flushing and dry season landscape irrigation. Installation could include single family, condo, and multi-family units.	Demand	Decentralized (rainwater, graywater)	NA	Nonpotable	No	No	