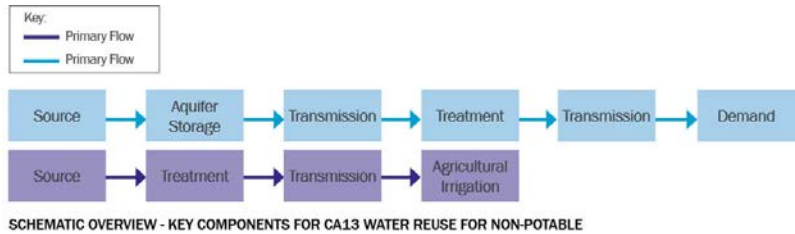


**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 13 - Water Reuse for Non-Potable

This alternative would 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 on leased land 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. In wet and average rainfall years, the City could ship excess potable water to SqCWD or SCWD for ASR. 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.

The alternative has several outstanding issues, e.g., 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.



Description: Recycled water for non-potable use

Applicable WCAs: WCA-09 ("Ripley: Reuse for Agriculture"), WCA - 40 ("Gratz: Recycled Water for Irrigation"), WCA - 41 ("McGilvray: (1) Recycled Water for Irrigation"), WCA - 45 ("McKinney: Additional Wells and WTPs"), WCA-64 ("Weizs: Water Recycling").

Applicable WCAs:

Estimated Annual Yield (million gallons [MG])	1,570
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Reliability Over Time (seasonal and inter-annual variability)

Costs	Best Estimate	Likely Range	Comments
Capital Cost (\$million)	25	15 to 50	
Annual (\$million)	1.2	TBD	
Present Value (30 years, \$million)	62	TBD	
Capital cost/MG annual capacity	5.8	TBD	
PV Cost/MG	39,000	TBD	
Energy (KWh/MG)	TBD	TBD	

Key Components

1. Tertiary Treatment (Title 22 unrestricted) or Complete Advanced Treatment at WWTP	4. Extraction wells (12 at 250 gpm each)
2. New line maintenance facility to free space at WWTP for new tertiary treatment	5. Return pipeline to connect to City's NC pipeline ((about 8 miles).
3. Delivery pipeline (14 miles) to convey recycled	6. Storage Reservoir to equalize daily demands

Implementation Requirements Summary

Required Land Area (acres)	<10
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Permitting Summary

Division of Drinking Water; ROW

EVALUATION

Technical Feasibility

Widely used.
Use of recycled water for crop irrigation with used throughout the state, with neighboring Monterey County having illustrated the safe practice in the mid 1990s.

Legal Feasibility

Yes, but some ambiguities.
Water rights and water transfer requirement; need to obtain land through easements or purchase for conveyance.

Regulatory Feasibility

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 13 - Water Reuse for Non-Potable

Slow but relatively sure.

Recycled water for crop irrigation is an approved use from a regulatory perspective, but working through the regulations and environmental review will take some time.

City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary

Consolidated Alternative 13 - Water Reuse for Non-Potable

Political Feasibility

Active resistance now.
Recent statements from public indicate current resistance to use of recycled water; however, it is assumed this could be overcome with an outreach program.

Regional Water Benefits

SC Water only.
Though ag would benefit, these are individual systems and not jurisdictional agencies.

Local Economy

Slight positive.
Assumes increased water supply stability would result in a more stable economy.

Energy

4
Assume only energy required for additional WW treatment beyond current level and pumping to North Coast users.

Marine Ecosystem Health

May harm
Some negative impact is assumed.

Freshwater and Riparian Health

About as it is now; freshwater and riparian health should be maintained

Terrestrial Resources

N/A

Environmental Profile

The environmental profile of this portfolio is acceptable with appropriate and effective mitigation.
Assumes impacts would exist but could be mitigated.

Groundwater Resources

Does not affect.
Assumes allowing to rest does not actually allow for restoration per criterion description.

Infrastructure Resilience

Meets most challenges well.
New infrastructure with current seismic/building codes

Supply Reliability

Makes system significantly more reliable.
Recycled water production is not directly impacted/limited by drought and is "drought proof source".

Scalability

Can scale up to ~1BG gap
Assumes enough ww available and WTP/storage capacities is available.

Preserves Future Choices

Increases choice.
City would be locked into recycled water; however, the size of the facilities could be scalable and done such that the system is only expanded if needed and could ultimately have additional treatment for IPR/DPR if pursued at a later time.

Yield

1,570 MG

Operational Flexibility

Moderately increases.
Relies on existing facilities to provide all water.

Addresses Peak Season Demand

Yes

Implementability

Could be implemented with some challenges.
Requires overcoming environmental, stakeholder, and community resistance hurdles.

Supply Diversity

Portfolio significantly increases the diversity of Santa Cruz's supply portfolio.
Additional supply dependent on ww which is "drought proof".

Sustainability

This portfolio is somewhat sustainable.
Assume portfolio would still use surface water which can be viewed to be less sustainable and now groundwater; however, purified water is more sustainable.

Issues to Resolve

Permitting; community resistance

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 10 - Water Reuse for Aquifer Recharge

This alternative would divert wastewater effluent for treatment to a higher level of tertiary treatment (i.e. purified water). The purified water would be used to recharge depleted aquifers and store water for potable use during dry periods. The California Division of Drinking Water allows addition of highly treated wastewater (purified water) to aquifers that will be later used for potable water demands.

Key:

- Primary Flow
- Primary Flow



SCHEMATIC OVERVIEW - KEY COMPONENTS FOR CA-10 WATER REUSE FOR AQUIFIER RECHARGE IPR

Description: Water reuse for aquifer storage and potable water demands during dry periods.

Applicable WCAs: WCA - 44 ("McGilvray: (8) Tertiary Treatment, Re-use"), WCA - 62 ("Smallman: (17) Recycled Water"), WCA - 64 ("Weizs: Water Recycling").

Estimated Annual Yield (million gallons [MG]) 1,100

Reliability Over Time (seasonal and inter-annual variability)

Costs	Best Estimate	Likely Range	Comments
Capital Cost			
Annual			
Present Value			
Capital cost/MG annual capacity			
PV Cost/MG			
Energy (KWh/MG)			

Key Components

- | | |
|---|--|
| 1. Treatment facilities to produce purified water. | 4. Extraction wells. |
| 2. New line maintenance facility to free space at WWTP for new treatment facilities | 5. Return pump station(s) and pipeline(s) for returning water to City. |
| 3. Pump station and pipeline(s) to convey water. | 6 |

Implementation Requirements Summary

Identify aquifer recharge locations and treatment facility needs. Obtain regulatory approval. Obtain voter and City Council approval. Complete CEQA process. Acquire site(s) for pump station(s) and establish final pipeline routes. Design, bid, build, and commission new facilities.

Required Land Area (acres)

TBD, depends on the treatment systems and delivery method to the aquifer

Permitting Summary

Division of Drinking Water; ROW

EVALUATION

Technical Feasibility

Demonstrated in the field.
A similar system has been in operation in Orange County for many years.

Legal Feasibility

Yes, but some ambiguities.
Assumes treatment facilities located at City or other agency sites and pipes stay within public ROW; aquifer recharge may require obtaining land.

Regulatory Feasibility

Very slow, no regulatory change.
Regulations are in place for recharging aquifers with recycled water; however, this system would be more complex given the number of agencies (regulatory and local) that would need to be involved.

City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary

Consolidated Alternative 10 - Water Reuse for Aquifer Recharge

Political Feasibility

Active resistance now.
Recent statements from public indicate current resistance to use of recycled water; however, it is assumed this could be overcome with an outreach program.

Regional Water Benefits

Across County.
Assumes recharge would occur in multiple locations to provide groundwater stability for county (reduce overdrafts and seawater intrusion).

Local Economy

Slight positive.
Assumes increased water supply stability would result in a more stable economy.

Energy

4
Assume only energy required for additional WW treatment beyond current level and pumping to aquifer recharge sites.

Marine Ecosystem Health

Does not harm; marine health should be maintained

Freshwater and Riparian Health

About as it is now; freshwater and riparian health should be maintained

Terrestrial Resources

N/A

Environmental Profile

The environmental profile of this portfolio is acceptable with appropriate and effective mitigation.
Assumes impacts would exist but could be mitigated.

Groundwater Resources

Actively restores.
Assumes not all water is recovered

Infrastructure Resilience

Meets most challenges well.
New infrastructure with current seismic/building codes

Supply Reliability

Makes system significantly more reliable.
Purified water production is not directly impacted/limited by drought and is "drought proof source".

Scalability

Can scale up to ~1BG gap
Assumes enough WW available and WTP/storage capacities is available.

Preserves Future Choices

Reduces choice.
City would be locked into purified water; however, the size of the facilities could be scalable and done such that the system is only expanded if needed.

Yield

1,100 MG

Operational Flexibility

Moderately increases.
Relies on existing facilities to provide all water.

Addresses Peak Season Demand

Yes

Implementability

Could be implemented with some challenges.
Requires overcoming environmental, interagency, community resistance hurdles.

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 10 - Water Reuse for Aquifer Recharge

Supply Diversity

Portfolio significantly increases the diversity of Santa Cruz's supply portfolio.
Additional supply dependent on WW which is "drought proof".

Sustainability

This portfolio is somewhat sustainable.
Assume portfolio would still use surface water which can be viewed to be less sustainable; however, purified water is more sustainable.

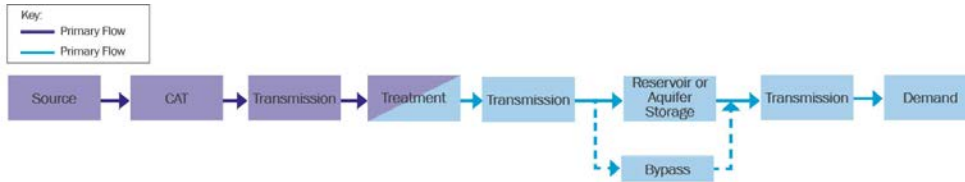
Issues to Resolve

Permitting; community resistance

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 11 - Water Reuse for Direct Potable

This alternative would divert wastewater effluent for treatment to a higher level of tertiary treatment (i.e. purified water). The purified water would be combined with raw water and treated at the City of Santa Cruz's water treatment plant. The California Division of Drinking Water is developing regulations to allow the use of the combination of highly treated wastewater (purified water) and raw water sources for portable water. The excess of purified water could be stored in aquifers to help restore and provide storage for potable water demands during dry periods.



Description: Water reuse of a combined flow of highly treated wastewater effluent and raw water for direct potable use.

Applicable WCAs: WCA - 11 ("SCWD: Water Reuse"), WCA - 46 ("McKinney: Water Reuse"), WCA - 64 ("Weizs: Water Recycling").

Estimated Annual Yield (million gallons [MG]) 1,100

Reliability Over Time (seasonal and inter-annual variability)

Costs	Best Estimate	Likely Range	Comments
Capital Cost			
Annual			
Present Value			
Capital cost/MG annual capacity			
PV Cost/MG			
Energy (KWh/MG)			

Key Components

- | | |
|---|---|
| 1. Treatment facilities to produce purified water. | 4. New or expanded WTP |
| 2. New line maintenance facility to free space at WWTP for new treatment facilities | 5. Pump station(s) and pipeline(s) for connecting new WTP to City distribution. |
| 3. Pump station and pipeline(s) to convey water to WTP. | 6 |

Implementation Requirements Summary

Identify treatment facility needs. Obtain regulatory approval. Obtain voter and City Council approval. Complete CEQA process. Acquire site(s) for pump station(s) and establish final pipeline routes. Design, bid, build, and commission new facilities.

Required Land Area (acres)

Permitting Summary

Division of Drinking Water; ROW

EVALUATION

Technical Feasibility

Promising in 3-5 years.
Treatment technologies are currently in state to produce highly purified water; however, proving a selected treatment system will likely take some time (once regulations allow).

Legal Feasibility

Yes, unambiguous.
Assumes treatment facilities located at City site(s) and pipes stay within public ROW.

Regulatory Feasibility

Very slow, up to 10 year new regulations.
The requires regulatory change that is under development and likely to be implemented in the next 3 years.

Political Feasibility

Active resistance now.
Recent statements from public indicate current resistance to use of recycled water; however, it is assumed this could be overcome with an outreach program.

Regional Water Benefits

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 11 - Water Reuse for Direct Potable

SC Water only.
DPR would only impact SC users.

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 11 - Water Reuse for Direct Potable

Local Economy

Slight positive.
Assumes increased water supply stability would result in a more stable economy.

Energy

4
Assume only energy required for additional WW treatment beyond current level and pumping to GHWTP.

Marine Ecosystem Health

Does not harm; marine health should be maintained

Freshwater and Riparian Health

About as it is now; freshwater and riparian health should be maintained

Terrestrial Resources

N/A

Environmental Profile

The environmental profile of this portfolio is acceptable with appropriate and effective mitigation.
Assumes impacts would exist but could be mitigated.

Groundwater Resources

Does not affect.

Infrastructure Resilience

Meets most challenges well.
New infrastructure with current seismic/building codes

Supply Reliability

Makes system significantly more reliable.
Purified water production is not directly impacted/limited by drought and is "drought proof source".

Scalability

Can scale up to ~1BG gap
Assumes enough WW available and WTP/storage capacities is available.

Preserves Future Choices

Reduces choice.
City would be locked into purified water; however, the size of the facilities could be scalable and done such that the system is only expanded if needed.

Yield

1,100 MG

Operational Flexibility

Moderately increases.
Relies on existing facilities to provide all water.

Addresses Peak Season Demand

Yes

Implementability

Could be implemented with some challenges.
Requires overcoming regulatory, environmental, interagency, community resistance hurdles.

Supply Diversity

Portfolio significantly increases the diversity of Santa Cruz's supply portfolio.
Additional supply dependent on WW which is "drought proof".

Sustainability

This portfolio is somewhat sustainable.
Assume portfolio would still use surface water which can be viewed to be less sustainable; however, purified water is more sustainable.

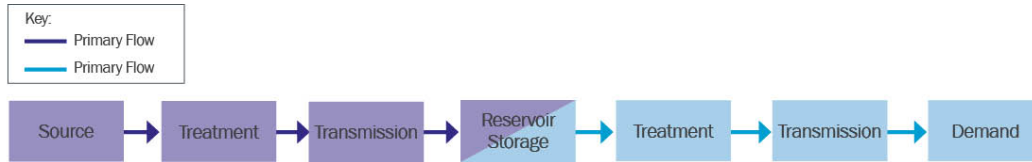
Issues to Resolve

Permitting; community resistance

**City of Santa Cruz Water Supply Advisory Committee
Solutions Phase -- Technical Summary**

Consolidated Alternative 12 - Water Reuse for Indirect Potable

This alternative for would divert wastewater effluent for treatment to a higher level of tertiary treatment (i.e. purified water). The purified water would be stored in the Loch Lomond Reservoir for subsequent treatment for potable use. Note that the California Division of Drinking Water is developing regulations to allow use of a combination of highly treated wastewater (purified water) and other raw water resources for potable water.



SCHEMATIC OVERVIEW - KEY COMPONENTS FOR CA-12 WATER REUSE FOR INDIRECT POTABLE REUSE

Description: Wastewater effluent treated at a higher level of tertiary treatment (i.e. recycled water) to be stored and reused during dry periods.

Applicable WCAs: WCA - 44 ("McGilvray: (8) Tertiary Treatment, Re-use"), WCA - 52 ("Paul: (17) Detention Tub String"), WCA - 62 ("Smallman: Recycled Water"), WCA - 64 ("Weizs: Water Recycling").

Estimated Annual Yield (million gallons [MG])

1,100

Reliability Over Time (seasonal and inter-annual variability)

Costs	Best Estimate	Likely Range	Comments
Capital Cost			
Annual			
Present Value			
Capital cost/MG annual capacity			
PV Cost/MG			
Energy (KWh/MG)			

Key Components

- | | |
|--|---|
| 1. Treatment facilities to produce purified water. | 4 |
| 2. New line maintenance facility to free space at WWTP for new treatment | 5 |
| 3. Pump station and pipeline(s) to convey water to Loch Lomond. | 6 |

Implementation Requirements Summary

Identify treatment facility needs. Obtain regulatory approval. Obtain voter and City Council approval. Complete CEQA process. Acquire site(s) for pump station(s) and establish final pipeline routes. Design, bid, build, and commission new facilities.

Required Land Area (acres)

Permitting Summary

Division of Drinking Water; ROW

EVALUATION

Technical Feasibility

Promising in 3-5 years.

Treatment technologies are currently in state to produce highly purified water; however, proving a selected treatment system will likely take

Legal Feasibility

Yes, but some ambiguities.

Assumes treatment facilities located at City or other agency sites and pipes stay within public ROW; aquifer recharge may require obtaining land.

Regulatory Feasibility

Very slow, up to 10 year new regulations.

The requires regulatory change that is under development and likely to be implemented in the next 3 years.

Political Feasibility

Active resistance now.

Recent statements from public indicate current resistance to use of recycled water; however, it is assumed this could be overcome with an outreach program.

City of Santa Cruz Water Supply Advisory Committee

Solutions Phase -- Technical Summary

Consolidated Alternative 12 - Water Reuse for Indirect Potable

Regional Water Benefits

SC Water only

Local Economy

Slight positive.

Assumes increased water supply stability would result in a more stable economy.

Energy

4

Assume only energy required for additional WW treatment beyond current level and pumping to Loch Lomond.

Marine Ecosystem Health

Does not harm; marine health should be maintained

Freshwater and Riparian Health

About as it is now; freshwater and riparian health should be maintained

Terrestrial Resources

N/A

Environmental Profile

The environmental profile of this portfolio is acceptable with appropriate and effective mitigation.

Assumes impacts would exist but could be mitigated.

Groundwater Resources

Allows restoration/Does not affect.

This could be seen as allowing restoration by decreasing the amount of surface water diverted but does not directly impact restoration

Infrastructure Resilience

Meets most challenges well.

New infrastructure with current seismic/building codes

Supply Reliability

Makes system significantly more reliable.

Purified water production is not directly impacted/limited by drought and is "drought proof source".

City of Santa Cruz Water Supply Advisory Committee

Solutions Phase -- Technical Summary

Consolidated Alternative 12 - Water Reuse for Indirect Potable

Scalability

Can scale up to ~1BG gap

Assumes enough WW available and WTP/storage capacities is available.

Preserves Future Choices

Reduces choice.

City would be locked into purified water; however, the size of the facilities could be scalable and done such that the system is only expanded if needed. Could also provide the platform for DPR.

Yield

1,100 MG

Operational Flexibility

Moderately increases.

Relies on existing facilities to provide all water.

Addresses Peak Season Demand

Yes

Implementability

Could be implemented with some challenges.

Requires overcoming regulatory, environmental, interagency, community resistance hurdles.

Supply Diversity

Portfolio significantly increases the diversity of Santa Cruz's supply portfolio.

Additional supply dependent on WW which is "drought proof".

Sustainability

This portfolio is somewhat sustainable.

Assume portfolio would still use surface water which can be viewed to be less sustainable; however, purified water is more sustainable.

Issues to Resolve

Permitting; community resistance