WASC Proposal ID: Smallman: Recycle

The Recycle Plan

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Introduction

During the environmental impact review for the Desalination Plant, (Desal), recycled water, (Recycle), was studied. The three main reasons why Desal was preferred over Recycle are:

1. Cost of distribution pipelines is too high.
2. You cannot inject the water into the ground because actual types of soil layers are unknown, too complex, and the water will contaminate wells.
3. The water came from toilets, and this makes me feel icky.

Several important developments happened since that time disputing these three reasons. The most important of which as Advanced Recycle Treatment plants are being constructed, and the water chemically analyzed, it is being discovered that the water is actually equivalent or better in quality than Desal. And, it uses about 1/3 the energy to produce. The Department of Public Health, CDPH, is constantly changing regulations with new technology. They reduced the detention time and removed the blending requirements for Advanced Recycle injection. The detention time was lowered from 6 months to 2 months. This meant injection wells had to be only 1 mile from potable wells. Eventually CDPH will approve injecting the water directly into distribution systems, i.e. “Direct Potable Reuse”. In addition, the Railroad Corridor was purchased, and everybody is realizing that this would be an ideal, cost effective area to install the distribution pipelines. And, they are seeing a train with a very poor business plan, likely to fail, and a very expensive parallel bike path. The treatment plant and the distribution pipelines just became a bargain vs. the 125 million parallel bike path and train. Finally, people are starting to use good scientific judgment instead of “icky” feelings to make this extremely vital decision.

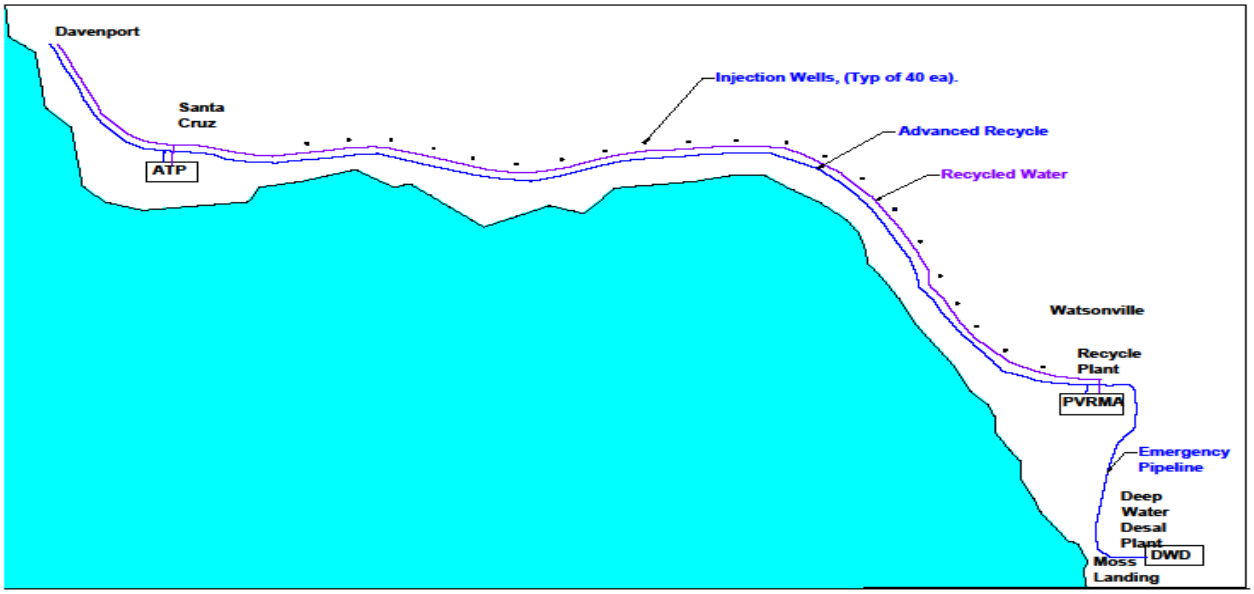
Cost and Productivity

Productivity: After initial construction, this system will produce, on average, 4 million gallons per day, MGD, of standard recycled water, and 4 MGD of purified, (advanced recycle), water. It will also provide a means for an emergency water connection to Deep Water Desal.

Cost: The cost for the Advanced Recycle Treatment Plant is 60 million, excluding land purchase. This includes a long pipeline connection to the sewage treatment plant. The cost for the long distribution pipelines is 50 million. This includes attaching pipe to, and improving all bridge structures. 15 million is allocated for injection wells and initial water service connections and hydrants. This does not include solar panel paving blocks or other utilities, and these be paid by others. It does include restoring as a bike path with asphalt surface if the solar paving block idea is not used. This would forgo the equivalent, estimated 125+ million, slow constructed, parallel bike path and train.

The Recycled Water Plan Steps

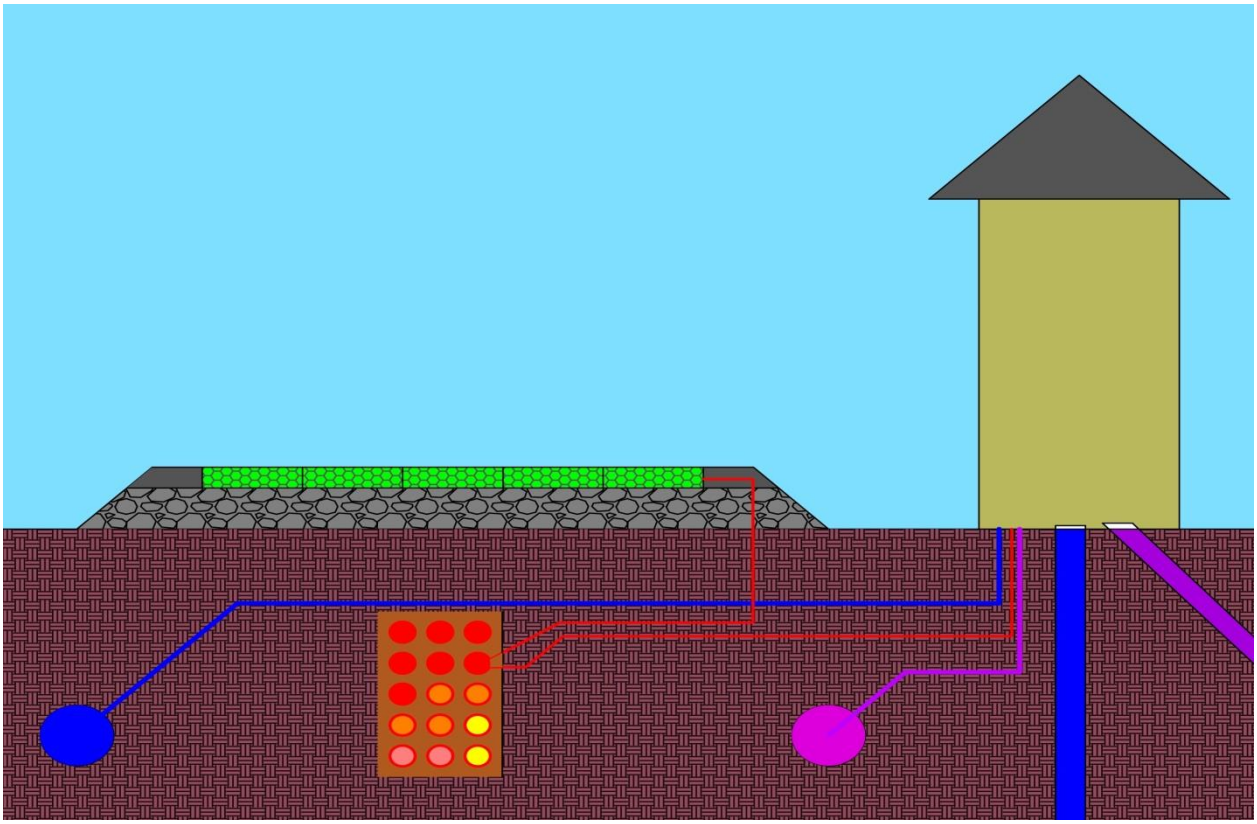
1. Build and Advanced Treated Recycled Water Treatment Plant at the corner of Delaware Avenue and Natural Bridges Drive. Cost is 60 Million. The plant has the capability of either creating standard recycled water or purified water. The purified water is as good or better quality as Desal, and uses about 1/3 of the energy to produce. The aversion to it is purely psychological. If you drink from the tap, this is less than 1.5 % of the total water you use each day. Buy bottled water and support this superior plan.
2. Develop plans for direct piping connections to distribution systems. The Department of Public Health will approve "Direct Potable Reuse" after further chemical analysis of the water. Scientific data trumps emotions when developing important regulations.
3. Divert the 8.4 Million Gallons of Water per day, currently carrying pollution into the Bay, down to the new plant in a large pipeline down Delaware Avenue to the plant.
4. Build two transmission mains, one standard recycle and the other purified water in the railroad corridor from Davenport to Watsonville.
5. Construct about 40 injection wells along the pipeline route in critical areas.
6. Connect pipelines to the Pajaro Valley Water Management Agency's Recycle Plant and Distribution System.
7. Add additional services for irrigation, (both North and South County farms), golf courses, manufacturing and fire protection.
8. If needed, construct an emergency pipeline, 6 miles long, through farmland, to the Deep Water Desal Plant in Moss Landing. Added cost is around 2-3 million.



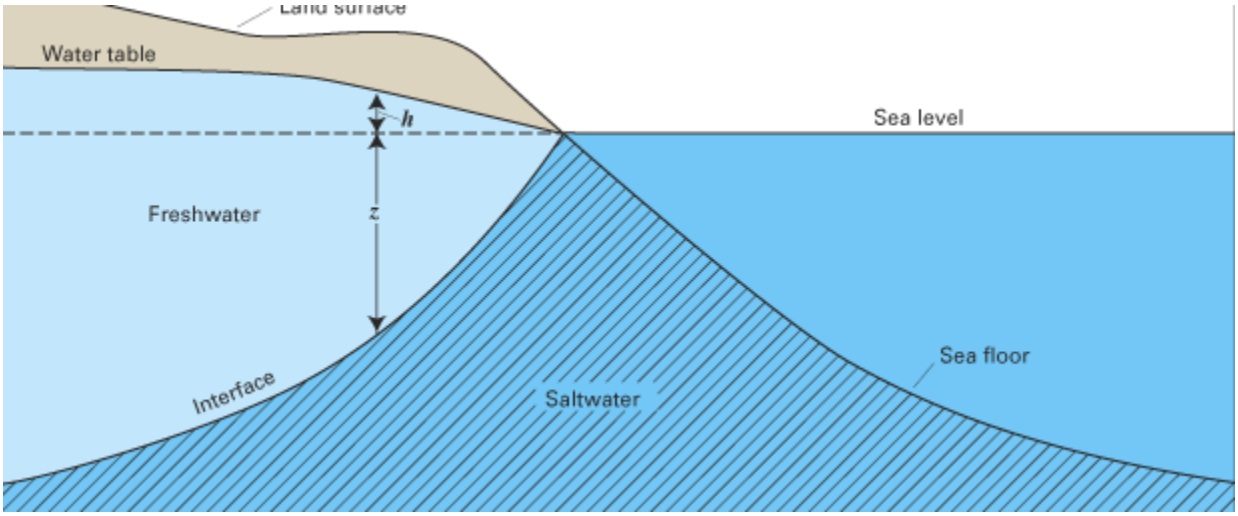
Utility Corridor

This is by far more beneficial, both environmentally and economically to the citizens of Santa Cruz County than a train, which may have to be subsidized. Do not let the Regional Transportation Commission build it. Instead:

1. Sell salvaging rights to a demolition contractor. Remove and salvage steel rails and ties. This can be done in about 2 months. The net profit from doing this is estimated to be around $650,000. In the interim, the corridor can immediately be used as a gravel path.
2. Seek out other utility companies, which may be interested in investing in the project, lowering overall cost.
3. Install a 16” or 18” Recycled Water and Advanced Recycle pipelines on either side. The pipelines would be attached to all of the bridges at crossings.
4. Install injection wells every ½ mile. They would be able to inject about 100 gallons a minute of each type of water, (There are some issues with injecting the standard recycle, which I will explain later).
5. The entire path restored as a bike path. A new product could possibly restore the surface, which is a solar panel paving block. These blocks can come with LED lights to light up the delineation lines at night. The energy sold to PG&E and used to power injection well pumps.



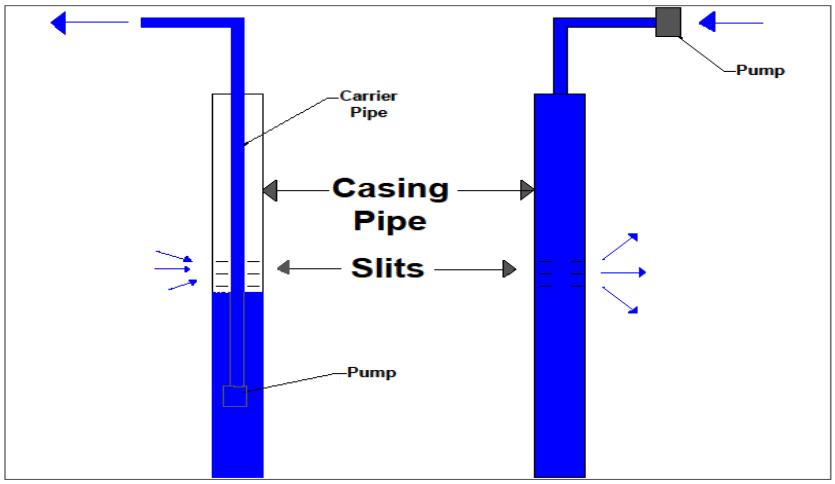
Saltwater Intrusion



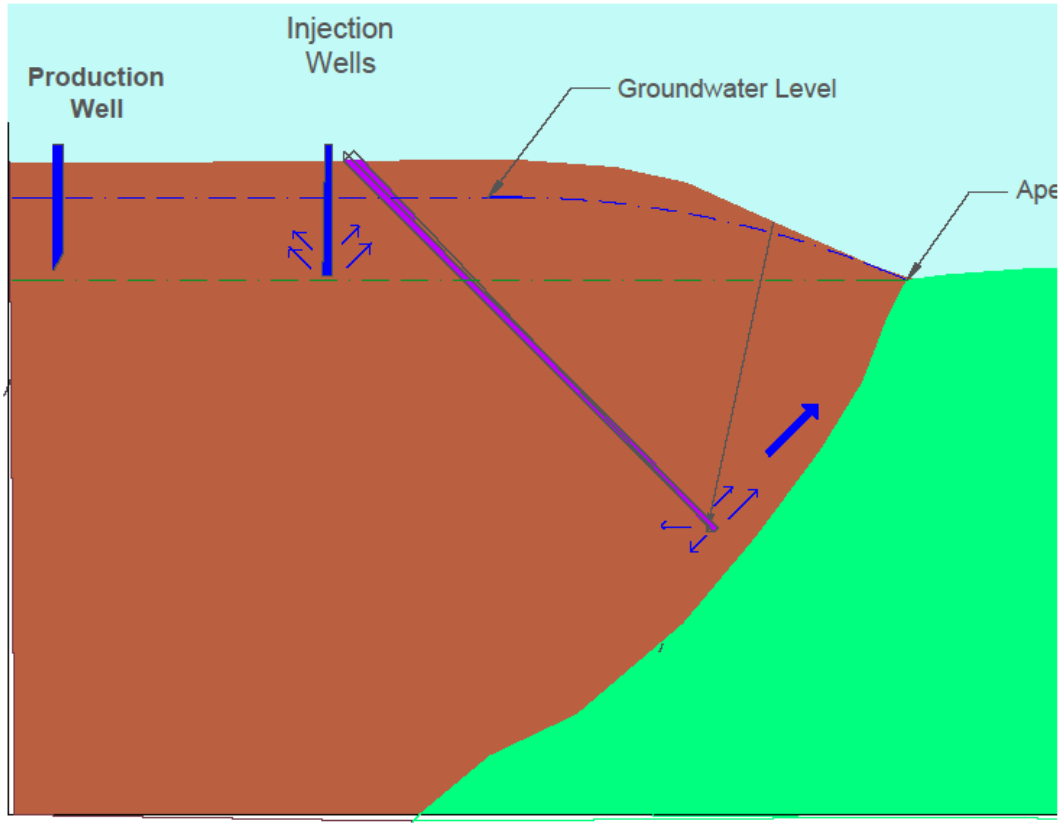
For simplicity, to really understand the physics of saltwater intrusion, imagine the ground as one, homogeneous, packed sand with the same amount of permeability. This will also help understand how the water moves when you inject water under pressure into it. In reality, the ground often has layers of low permeable rock, which can divert the water. Nature is always imperfect, so the water finds its way around these obstacles, and always moves in the direction of lowest pressure. Saltwater weighs slightly more, and the pressure is equalized when the freshwater is about ¼" higher. This is why saltwater creates a wedged curved barrier with the freshwater. The freshwater has to stay above the mean sea level to prevent intrusion; most Hydrologists recommend ten feet minimum. The freshwater seeps down and seeps into the ocean, as it continually does this naturally. There is one way to slow it down, which I will explain later.

Injection Wells

Standard production wells have a casing pipe that has slits on the sides of it in layers of permeable sand to allow water to flow into it. A pump is placed on the bottom and pumps water, (less than the amount seeping in the casing), up through a carrier pipe. This well can be made into an injection well by simply removing the pump and carrier pipe, sealing the top of the casing, and installing a pressure pump which fills the entire casing with pressurized water. An injection well is far less costly to maintain because there is no carrier pipe, and the slits do not get clogged up with silt requiring costly acid treatment that production wells require.



Groundwater Injection



The California Department of Health, CDPH, recently changed its regulations about ground water injection using Advanced Recycled Water. As stated earlier, chemical analysis will show that has a higher quality than Desal and produced for less cost. CDPH will further look at this scientific data and eventually allow this water to be directly injected into the distribution system(s). For now, and in the future, the ground provides a cheap water storage area with no evaporation. So, the Advanced Recycle could be injecting up to about 4000 gallons a minute along the corridor with the goal of adding to rainfall and keeping the ground water level 10 feet above sea level and insuring that saltwater intrusion does not occur. This water simply adds more water with rainfall that seeps down from gravity into the basin. Another added option idea is to inject the standard recycle deeper and closer to the freshwater/saltwater barrier. CDPH will not allow this if there is any chance this water will migrate to a production well in less than 6 months. As stated earlier, the physics show that this water under pressure will push the other molecules of water to the area of lowest pressure at the apex. It is highly unlikely there is a non-permeable layer of rock, with no cracks, that the water would not move around it and eventually move up the barrier and then seeps into the ocean, receiving some additional treatment underground. Keep in mind that we are not talking about water moving in open air, the water molecules are moving in between a lattice of soil particles. So the recycled water seeps into the ocean, and the freshwater seeping down from gravity meets this water and mixes with the water coming up. A fixed amount of water seeps and mixes with the saltwater, so this slows the amount of freshwater seeping into the ocean is reduced.

Other Important Considerations

Both the Santa Cruz and Watsonville Waste Water Treatment Plant produce about the same amount of secondary treated wastewater. The Pajaro Valley Water Management Agency, PVRMA, recycles about ½ of Watsonville's wastewater. At certain times of the year, they have a surplus of standard recycled water, and could contribute water into the utility corridor pipelines. In the future, an Advanced Recycle Treatment Plant could be built next to the PVRMA facility, adding another valuable potable water source connected to the utility corridor distribution pipeline.

The distribution of standard recycled water for agriculture can be expanded to a degree that it may not be necessary to inject any of it into the ground water basin. I believe that PVRMA could expand distribution further into the Pajaro Valley. In addition, in between Watsonville and La Selva Beach, and in between Santa Cruz and Davenport are farms, which could easily accept large irrigation services. The utility corridor goes through Seascape golf course and resort, which could accept a large, low cost, service to connect to their irrigation system. Longer branch lines could possibly be installed to other large landscape and fire protection services. Fire hydrants would be installed along the bike path. All of this water will replace water that is currently being supplied from the ground water basin.

The Santa Clara Valley Water District and City of San Jose recently constructed an Advanced Recycled Treatment Plant next to San Jose's large, 110 MGD, wastewater treatment plant, which purifies about 10 MGD. Santa Cruz produces, on average, 8.4 MGD, and it is wasted into the ocean. The recovery rate for recycle is 100%, because any backwash water simply goes back to the sewage treatment plant. With Desal, the backwash is brine water and dumped into the ocean. So if you assume about 0.4 MGD of backwash, the plant could produce 4 MGD of Standard Recycle and 4 MGD of purified Advanced Recycle. The plant would have the flexibility to produce one or the other. In comparison, the proposed Desal plant was to produce only 2.6 MGD of purified water. In addition, the reverse osmosis filters, RO, are identical for Advanced Recycle and Desal. There is a new RO filter material, "Graphene", being developed, which claims to cut energy use even further.

Saltwater has 35,000 parts per million of salt. Secondary treated wastewater has a fraction of that of chemicals that can be broken down by bacterial action. Water from the ocean also has these chemicals in addition to the salt. In fact, the only motivation to construct the Deep Water Desal plant, DWD, is that there are less organic chemicals. The salinity is about the same. The San Jose plant just started operation and they plan to do extensive chemical analysis of this water which is likely to show that it is of equal or higher quality than Desal. It makes no sense whatsoever to desalinate seawater if you have wastewater that can be recycled, yet many people, even highly educated people, still feel Desal is better just because of where the water comes from. Their minds are controlled by emotions, not by critical scientific thought.

The final tab for the San Jose plant was reported in the newspaper to be 72 million. This includes long pipeline connections to the wastewater treatment plant. The lowest bid for the construction of the project was 43 million, which increased to 57 million. Santa Cruz would need a plant of the same capacity, but may elect to only advance treat ½ of the water, and the other half to standard recycle, so the number of reverse osmosis filters would be cut in half. This would significantly lower cost and energy use, so around 60 million, is a good estimate.

When designing a recycled water system, it is best to add more areas where the water can go than can be produced. This guarantees all the water will go to effective use. For example, the Scotts Valley Recycled Water System always had a surplus, and they discovered that they could effectively provide water to the Pasatiempo Golf Course. For all these years Scotts Valley could have been providing this water to Pasatiempo, if the initial designers had this foresight. This system provides for the maximum amount of possible service areas and flexibility. This is because the utility corridor goes through the most populated areas in the County, and some of the largest agricultural areas. A treatment plant that can produce either standard recycle or purified water, allows the flexibility of producing which type of water which is needed most, with it being desirable to produce mostly standard recycle because it uses less energy.

Effectiveness, Practicability, Environmental and Community Considerations

- ***Effectiveness:*** The water that comes out of the wastewater treatment plants is free and easily diverted by pipeline modifications to an Advanced Recycled Water Treatment Plant. The technology is really not confined to desalination; it is basically removal of unwanted chemicals of any water. Saltwater is something we have basically an infinite source of, and could potentially lead to unlimited growth. Recycle has far less unwanted chemicals, which also are removed by bacterial action. Bottom line, Recycle is more effective than Desal. It is a finite water source, and force people to design a sustainable system. Taking the Desal route, this leaves the legacy of unlimited growth, depleting all other resources for future generations.

- ***Practicability:*** Having the railroad corridor available to change into a utility corridor is almost like getting a "Gift from God". It runs along the coastline through the most populated areas of the County. It also runs through acres of very fertile agricultural properties. On top of this, it is close to the coast, so it is the ideal location to inject water to prevent saltwater intrusion. In short, it is by far the most practical area to place these pipelines. If Desal was deemed the most practical solution, then Advanced Recycle is even more practical, because using it requires less energy, less cost, and using it eliminates pollution in the Bay.

- ***Environmental Considerations:*** There are no negative environmental impacts for this proposal, only enormously positive ones. First, the 8.4 million gallons of water currently dumping into the ocean carries an enormous amount of organic chemical pollution. Its true bacteria continue to break down these chemicals, but it is also a breeding ground for disease. The RO technology provides a means to remove these chemicals and send them back to the sewage treatment plant, which allows more time for the bacteria to break them down so that it does not create disease in people or animals.

- ***Community Considerations:*** Following this plan, the railroad corridor can quickly become a gravel path for hikers and bicyclists, and then restored as a paved bike path. Proposition 116 has language in it that the corridor must be used for a train. Does this make any sense if the train in not financially sustainable? Moreover, who are the person(s) responsible for influencing this requirement into this legislation? There is no timeline to build the 125 million dollar parallel bike path, yet the City and Soquel Creek Water District were fully ready to spend 125 million on Desal. In my opinion, the real needs of the Community are being ignored by this folly of a train and parallel bike path, when the Community can immediately have a gravel path and, in the future, a paved bike path and a sustainable water system. What has priority? Water or Train?