

## **BRINE DISCHARGE – additional notes from Chris Povey, expert in desalination**

The key issue with brine (for any Auckland proposal) is:

- the amount of salt in the discharge
- the presence of other chemicals from the treatment process

Before a desalination plant is constructed, a detailed environmental assessment would need to be made.

AND

Ongoing environmental monitoring would need to be organized so that we would know if there was anything going wrong at each brine discharge point.

NOTE: Despite the number of desalination plants around the world there haven't been that many definitive studies undertaken on the long term effects. However, the general consensus is that it's about design. A well-designed system in which the brine quickly mixes into the surrounding seawater doesn't have a bad impact on the immediate environment.

Identifying a good location for discharge of the brine is very important.

**If you're interested in an academic view, read the below which is from this scientific article:**

*Fernández-Torquemada, Yolanda, Adoración Carratalá, and José Luis Sánchez Lizaso. "Impact of brine on the marine environment and how it can be reduced." Desalination and Water Treatment 167 (2019): 27-37.*

Some marine organisms can withstand small salinity variations or occasional exposure to extreme levels. However, extreme, abrupt, and persistent changes can result in physiological stress, causing mortality of less mobile organisms that cannot escape. Additionally, such salinity changes often occur simultaneously with changes in temperature, turbidity, or pH, which can in turn alter the tolerance of marine species to salinity changes [61-63]. Consequently, an area influenced by a hypersaline discharge can have reduced biodiversity due to the disappearance of most sensitive species, thereby proliferating more tolerant species [34]. To minimize effects on marine biota, sensitive habitats and communities or zones with protected, endangered, or key species (such as seagrass meadows, maërl beds, coralligenous and coral reefs, and mangroves) must be avoided when possible. Hypersaline brines should be preferably discharge in areas with sandy seafloors without vegetation.

Other options for putting brine into the environment include:

- Blend brine with fresh water from wastewater treatment plant effluent. Mixing low salinity with brine to produce a kind of water with a level of salt (salinity) similar to seawater.
- Deep groundwater injection – unlikely to be an option in the Auckland area
- Evaporation ponds – Very large areas required, more suited to hot dry climates, not practical in urban context
- Crystallisation – distillation, mechanical vapour compression – very high energy processes to evaporate off the water and leave to residual salts. Not currently applied at this scale, requires large heat source or power supply.

We might be able to use the brine for production of salt products (eg table salt, Epsom Salts), bromine, heat storage for alternative energy schemes, or aquaculture (farming in the ocean) but these would be of limited scale compared to the volumes of brine produced so you would still need to get rid of heaps of brine. Some valuable minerals and metals are present in seawater in tiny concentrations but no cost effective technologies exist to capture them (at present).