

## ***DESALINATED WATER: WHAT YOU DON'T KNOW MAY HURT YOU***

*Desalination of San Francisco Bay water for human consumption needs to be considered in the context of:*

- *Limitation of scientific methodology and funding*
- *A broken regulatory system reflected in inadequate standards and insufficient enforcement*
- *Selection of a known polluted source water*
- *Evidence of technology failures*
- *Biased promotion by a public agency which is committed to the mission of promoting desalination in collaboration with the desalination industry*

*Assuring public health and safety of desalinated bay water would rely on the following assurances which do not exist:*

- *Identification of all contaminants, regulated and unregulated, in the Bay*
- *Prevention of the sources of contamination in the Bay*
- *Evaluation of possible health risks from contaminants – individual substances and their potential interactions; their short-term and cumulative impacts at varied exposure levels*
- *Regulation and enforcement by State and Federal oversight agencies which is thorough, reliable and timely so as to protect public health*
- *Guarantee that all soluble contaminants cannot permeate reverse osmosis membranes*
- *RO membranes cannot be compromised by bio-fouling and degradation, potentially allowing contamination of drinking water*

### ***THE POLLUTED SOURCE – SAN FRANCISCO BAY***

*The Bay is known to be a toxic soup; there is much in this “soup” we do not want to drink because it is unhealthy such as chemicals, heavy metals and biologic hazards from sewage, urban and agricultural runoff, industry and oil spills. According to an experienced consultant, “treating for more than 4 or 5 contaminants indicates there is a serious problem with the source.”*

#### ***Industrial Pollution***

*The S.F.-Oakland-Fremont, CA Metro Area had 10 EPA hazardous site responses, 127 facilities releasing toxic chemicals with over 6 million pounds of toxic chemicals released in the area (2007).*

*1,300 industrial facilities within the Bay Area discharge polluted storm water runoff with high concentrations of pollutants, such as toxic metals, petroleum and hydrocarbons. These are discharged directly into water as well as into the air as industrial emissions that settle on land and become runoff. Water has been contaminated by industrial and municipal facilities that are often located adjacent to or on creeks and bays. For example, a sewage treatment plant, Chevron’s industrial holding ponds and refinery and a land fill all border a marsh at the mouth of the San Pablo watershed.*

*Among the chemical contaminants found in San Pablo Bay, just north of our proposed desalination site, are the following: chlordane, DDT, dieldrin, dioxine compounds, furan compounds, mercury, nickel, PCB's and selenium. Across the bay in Contra Costa County, there have been 206 reported illegal water discharges from industrial facilities between 2006-2008. In fact, Contra Costa was one of the top 25 counties in the U.S. exceeding their NPDES permits. Water contamination studies from Richmond, North Richmond and San Pablo Bay illustrate toxins from urban runoff and industrial discharges which could create health risks for people.*

### **Oil Refinery Pollution**

*In 2005, Shell and Chevron each legally released about half a billion pounds of contaminants, with no consideration given to their cumulative impact. Five bayside oil refineries emit mercury which is then deposited in the Bay. Baykeeper estimates that 3,700 pounds of mercury, a neurological and developmental toxin, are released each year. We also get mercury in the Bay from urban stormwater pollution, industrial wastewater and air pollution from sewage treatment plants. Selenium, a neurotoxin, is also discharged as waste from oil refineries.*

### **Wastewater Treatment Pollution**

*Water is contaminated with 42 pollutants which are residues of water treatment, storage and distribution, including chemical byproducts of water disinfection. 24 of these are unregulated with no limits and potential for harmful byproducts when disinfectants react with organic pollution from runoff. Little is known about small-dose chronic exposure to multiple organic wastewater contaminants. Treatment disinfectants can increase risks of cancer and problems with development and reproduction. Wastewater treatment plants using outdated current technologies are creating risks of unknown magnitude for public health.*

### **Urban Runoff/Sprawl Pollution**

*According to the Environmental Health News, wastewater treatment plants are not designed to remove nutrients, estrogenic compounds, pharmaceuticals and personal care products (PPCP's). San Francisco Bay has high levels of flame retardants and PBDE's (polybromated diphenylethers). Urban runoff includes pesticides like atrazine from lawns, parks, gardens and golf courses. 56% of urban/sprawl runoff chemicals are unregulated with no legally mandated limit.*

### **Naval Fleet and Shipping Pollution**

*The mothball fleet in Benicia was found in violation of Clean Water Laws with 20 tons of paint flaking off containing lead, chromium and other heavy metals into Suisun Bay – of 55 ships they have 53 yet to clean up! Add to this bunker oil spills in 2007 and 2009 with their impact extending for years due to its inability to break down.*

## **Sewage Pollution**

*The repeated raw and partially treated sewage spills in the Bay involve hundreds of gallons from at least 9 sewage treatment plants in Marin, the East Bay and South Bay. Richmond has one of the highest spill rates in the state; it had 22 spills of 2 million gallons in the first 2 months of 2008!*

## **REGULATORY FAILURE**

### **Violations**

*Regulatory absence has allowed chemical companies to violate the Clean Water Act 500,000 times in the last 5 years with most unpunished; significant actions have been taken only 3% of the time. The Duhigg series in the N.Y. Times illustrates the extent of illegal concentrations of chemicals and dangerous bacteria from sewage in our nation's water supplies.*

### **Lack of Regulation**

*Regulation is inadequate and standards exist for only a small percentage of substances. Unregulated contaminants are not subject to health and safety regulations and can be legally present in any amount; a "not detected" contaminant can be present and unsafe but unreported if below the allowed detection limit. Today's chemicals are subtle – you can't see, taste or smell them so public drinking tests are superficial and misleading.*

*There are tens of thousands of CEC's (Contaminants of Emerging Concern) of which only 129 priority chemicals are regulated under the USEPA's Safe Drinking Water Act and Clean Water Act. Approximately 100,000 chemicals have been registered for use in the U.S. in the last 30 years, including industrial chemicals, food additives, cosmetic ingredients, pharmaceuticals, pesticides and active ingredients.*

### **Lack of Health Screening**

*The most basic toxicity testing results and basic health screening data cannot be found in the public record for nearly 75% of the top volume chemicals. For this group of chemicals there is no basis for assurance that their use does not pose health risks, whether assurance is offered by industry or government. More than half of industrial chemicals found in tap water are unregulated with no legally mandated limit. EPA estimates that 150 million pounds of PCB's are dispersed throughout the environment, including in air and water supplies.*

### **Chemical Ignorance**

*Chemical safety requires facts; government policy and regulation have been ineffective in making progress against the chemical ignorance problem. Ignorance means that any assurance of safety is unfounded. The public may be informed about some potential sources of exposure to a few hundred chemicals with partially known risks but we don't have information about all the major unscreened chemicals and their sources which can pose unknown health risks.*

*Extreme data gaps and limited resources hinder science-based decision making. A lack of basic*

*information and the technology to efficiently measure most CEC's hampers the ability of researchers to assess potential risks associated with these chemicals, especially at trace levels (parts per trillion).*

### ***Insufficient Study and Standards***

*The U.S. hasn't set new drinking water standards since 2001! EPA has failed to set standards for pharmaceuticals and failed to require utilities to test for these chemicals. Of the top 200 drugs in the U.S., 13% list serious side effects at levels less than 100 parts per billion in human blood, with some potential risks at parts per trillion. Drinking water treatment plants are not designed to remove these residues. Since they are unregulated, any level is legal in tap water.*

*Knowledge of a chemical's fate and potential for toxicity, including an understanding of the potential implications to humans and wildlife for both short and long term exposure necessary for governmental agencies to establish chemical concentrations protective for human and ecological health.*

*Not one chemical has been added to those regulated by the Safe Drinking Water Act since 2000. Two thousand new chemicals go to market each year. Every 5 years, the EPA publishes a CCL (Contaminant Candidate List) from which 5 are designated for study and that list can be rolled over to the next cycle. The office of Budget and Management has urged EPA to expediently accept old industry data rather than conduct current studies. Standards do not get updated to reflect new knowledge of risks at lower concentrations. EPA approves 2 a day; 80% of these are within 3 weeks of industry application. Another example: in 1996, Congress asked the EPA to analyze endocrine disruptors; 13 years later, no EPA action had been taken. The NDRC reports that fewer than 1,000 of 100,000 synthetic chemicals have been tested for endocrine disrupting chemicals.*

*Much of the information, including the chemical identities in commercial formulations is characterized as confidential business information and unavailable for public review so relevant risk assessment and toxicity thresholds often cannot be developed.*

*Basic information regarding the occurrence, persistence and degradation products in the environment is unavailable for the majority of ECE's in use. Chemicals are often released in large quantities and become diffusely distributed before adverse effects on people and the environment are observed.*

*Under the current system, regulated protections cannot be established prior to demonstrated harm.*

*The legal limits for 40% of regulated contaminants are set higher than the health-based limits due to the requirement that their removal costs be considered.*

### ***Lack of Health Protection***

*There is a lack of assessment of the cumulative risks or adverse interactions of multiple pollutants in water.*

*Generalized risk levels don't consider vulnerable populations (children, the elderly or immunocompromised) who are more susceptible to the adverse effects of contaminants.*

*Toxic bioaccumulations can cause diseases, including many cancers, that remain asymptomatic or subclinical for years and the causal contaminants are difficult to identify, especially if there is a*

*significantly long exposure that makes the disease and the associated chemicals causing it hard to isolate. With all these concerns assurance the health safety of water from highly toxic sources is unjustifiable. Given the alarming incidence and prevalence of cancer in Marin from as yet undetermined sources, we need to be conservative about adding any potential risks.*

### **MEMBRANE RISKS**

*Failure of desal membranes is a common problem and allows contamination. The water fed into a desalination system may introduce biological and chemical contaminants that are hazardous to human health.*

*Membranes fail for a number of reasons, including oxidation by chlorine and metals, and mechanical damage from sediment. In a study analysis “sharp, irregular particles were observed which had been pressed deep into the membrane surface.” Moreover, small leaks and in some cases up to 0.2mm long were seen in the membrane which were obviously caused by the particles on the surface. The successful operation of RO membranes is often impaired by fouling and failure of the membranes. Failures are expensive and permit pathogens and contaminants to compromise quality of the final product.*

*RO membranes also alter the chemical content of the water. RO lowers the calcium and carbonate concentrations, which produces acidic product water that can corrode the distribution system, leaching iron and other toxic metals like copper, lead, cadmium, zinc and nickel from the distribution system unless successfully post-treated. The membranes clog and require both frequent treatment with caustic cleaning fluids and regular expensive replacement.*

*Fouling occurs to some degree in all RO systems and therefore, much more research is needed; it causes sufficient degradation of membrane performance and longevity. In the Tampa Bay Desal Plant test run in 2003, a 14 day performance uncovered 31 deficiencies, most serious of which was membrane fouling that led to frequent shutdowns and inconsistent operations. Apparently, the challenge of membrane fouling is so significant there is an international conference being held to address this concern.*

*In contrast to contentions that RO membranes are an absolute barrier to contaminants, the MMWD itself describes 3 contaminants that permeated their test membranes: boron, chloride and TDS (Total Dissolvable Solids)*

### **COMPROMISED MESSAGING AND PUBLIC INTEREST**

*MMWD is a member of a special interest group whose mission is to promote desalination in collaboration with other desal industry corporations. This demonstrates a lack of objectivity and transparency. The precautionary principle requires that we pursue water policy alternatives that present the least risk to human health, i.e. conservation and efficiency. We should live sustainably within our watershed, which can provide amply for our needs while applying the Precautionary Principle, protecting ourselves from unknown, undetectable and unnecessary potential health risks.*

*Written by Mrs. Ann Spake and Dr. Lisa Fromer*

***Potential Hazards of Bay Water:  
RECOMMENDED INFORMATION RESOURCES***

**REPORTS**

Workshop Report: *Managing Contaminants of Emerging Concerns in California: Developing Processes for Prioritizing, Monitoring, and Determining Thresholds of Concern* (September, 2009) Rec. Executive Summary and pp. 1 – 4

*This was a workshop of 50 scientists, water quality managers & stakeholders, sponsored by:*  
*California Ocean Science Trust*  
*National Water Research Institute*  
*San Francisco Estuary Institute*  
*Southern California Coastal Water Research Project*  
*University of California, Irvine – Urban Water Research Center*

The Environmental Defense Fund (EDF).

*Toxic Ignorance : The Continuing Absence of Basic Health Testing for Top-Selling Chemicals In the U.S*

“Toxic Waters” by Charles Duhigg (2009) a series of reports from The New York Times

*“That Tap Water Is Legal but May Be Unhealthy,” “Clean Water Laws Are Neglected at a Cost in Suffering,”  
 “EPA Vows Better Effort on Water,” “Clean Water: Still Elusive,” “Millions in U.S. Drink Dirty Water, Records Show,” and “Health Concerns Grow Over Major Weed Killer.”*

California Coastkeeper Alliance.

*Coastal Mandatory Minimum Penalty Violations In California 1/1/2000 – 12/1/2009 Region 2  
 San Francisco Bay*

Environmental Working Group Reports.

*“Pharmaceuticals Pollute U.S. Tap Water,” “Policy Gaps Lead to Health Risks,” “Over 300 Pollutants in U.S. Tap Water,” and “Drinking Water Pollution Has Many Sources.”*

Pacific Institute Report. *Water Contamination in Creeks and Bays*

*Information regarding impaired water bodies, lists of contaminants and illegal water discharges for Contra Costa industrial facilities 2005 – 2008 (Richmond, North Richmond, and San Pablo Bay as well as central San Francisco Bay)*

N.R.D.C. ON EARTH Special Report. *“Hundreds of Man-made Chemicals – In Our Air, Our Water, and Our Food – Could Be Damaging The Most Basic Building Blocks of Human Development”* by Gay Daly

WHO Reports (2004 & 2007). *“Health Risks From Drinking Demineralized Water”* by F. Kozise

*states that the present knowledge of the human health implications of desalination activity is limited and recommends further research*

Baykeeper Website articles. *“Stopping the Flow of Industrial Chemicals to the Bay,” “Heavy Rains Bring Sewage Spills to the Bay,” “Marin Sewage Spills –The Latest Threat to the Bay,” “Keeping Toxics Out of the Bay,” and “Mercury In the Bay”*

EDF. *“Protecting Human Health – What We’ve Accomplished & What Lies Ahead”* (December, 2009)

Pacific Institute. *Desalination, With a Grain of Salt – A California Perspective* (Health Concerns, pp.53-55)

**NEWSPAPER AND MAGAZINE ARTICLES & STUDIES**

Water and Wastes Digest Magazine Article. *“Tampa Bay Water Desalination Plant To Run Less Often, Undergo Repairs”*

S.F Chronicle. *“Stronger Controls Urged On Chemicals In Water”* (January 12, 2010) by C. Jones and *“Fuel Spill Taxes Already Fragile Bay”* by Kelly Zito (October, 2009)

USA Today. *“States Struggling With EPA Rules”* by B. Winter (February, 2010)

The Mercury News. *“Mothball Fleet Maintenance Unlawful, Judge Rules”* by Mike Taugher (January, 2009 from The Contra Costa Times)

latimes.com. *“Tests on Pesticides Criticized”* by Alexander Hart (from The Tribune Washington Bureau)

Technology – *Emerging Contaminants – Taking POU/POE to the Next Level: “Consumers, EPA and Industry are setting their sights on these substances”*

AOL News Alert article. *“9 Unexpected Things In Drinking Water”*

Press Democrat. *“Study says even ‘safe’ drinking water poses risks to elderly”* (September 21, 2009)

Forbes Magazine. *“America’s Most Toxic Cities”* by Francesca Levy

Environmental Health News. Synopsis *“Evidence for the Migration of Steroidal Estrogens Through Riverbed Sediments”* (into drinking water source & not removed by WWTP) by Drs. Orlando, Chande & Wendy Hessler

San Francisco Estuary Institute. *Preliminary study on Pharmaceuticals and Personal Care Products in the South Bay* (June, 2007) from the Emerging Contaminants Workgroup

Science Direct. Abstract: *“Microscopy as a Tool for Analysis of Membrane Failure & Fouling”* by Emond W. F. de Roever & Ingmar H. Hulsman

Reverse Osmosis: *Membrane Fouling – Abstract “The Final Frontier”* by D. Paul & A. Abanmy

**AGENCIES**

EPA Drinking Water Contaminant Candidate List and Regulatory Determinations  
*“EPA Bans PCB Manufacture; Phases Out Uses”*

MMWD Annual Water Quality Report 2009. *“Special Notice for Immuno-Compromised Persons”*