

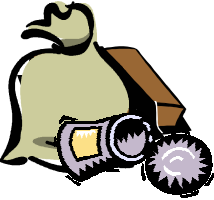










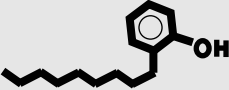


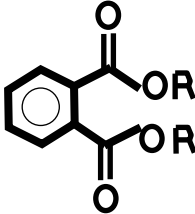
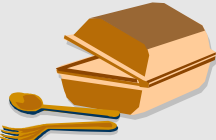
POLLUTANTS OF CONCERN FROM MARITIME INDUSTRIES


Created 2011 by Virginia St. Jean from the San Francisco Department of Public Health in partnership with the California Department of Toxics Substances Control

Pollutant	Origin/Sources	Human & Environmental Impacts	BMP for Pollution Prevention
Copper ^{8,13} Zinc ¹³ Tributyltin Arsenic ¹³ Mercury ^{13,2}	<ul style="list-style-type: none"> • Anti-fouling hull paint • Architectural materials • Sacrificial zinc anodes • Motor oil • Tires • Legacy anti-fouling hull paint • Paint • Pesticides • Wood Preservatives (as chromate copper arsenate) • Float switches for bilge pumps • Shower water storage tank pumps • Thermostats 	<ul style="list-style-type: none"> • Metals can attach to particles in the water column and in the sediment. • Even if the concentration of metals in the water is small, metals can undergo bioaccumulation as it is ingested by organisms which are in turn ingested by organisms higher in the food chain. • The concentration of metals in the fish and other organisms consumed by humans can reach toxic levels (e.g. fish advisories due to high levels of mercury, oyster advisories due to high levels of copper.) • Metals can be toxic to aquatic life and humans • Heavy metals are persistent in the environment 	<ul style="list-style-type: none"> • Use alternative, non-biocide hull coatings • Use vacuum sanders to both remove paint from hulls and to collect paint dust and chips to avoid paint being carried into the water by storm water runoff • Perform pressure washing and hydro washing on land and prevent the resulting paint chips from entering surface waters • Product substitution – see <i>Purchasing Guide</i> • Properly dispose of oil, fuel, paints, switches containing metals as hazardous waste
Nutrients (i.e. nitrates, phosphates) ¹³ 	<ul style="list-style-type: none"> • Grey water (clothes & dish washer, sinks, showers) • Fertilizer • Detergents containing phosphorous • Trash i.e. food waste 	<ul style="list-style-type: none"> • Contributes to excessive growth of algae and phytoplankton decreasing the concentration of dissolved oxygen and decreasing water clarity • Encourages growth of weedy plants which may entangle propellers and pipelines • Decreases the dissolved oxygen in the water due to the decomposition of organic matter • Degrades water quality as less oxygen is available for aquatic life 	<ul style="list-style-type: none"> • Dispose of gray water properly on land • Prevent trash from entering waterways • Dispose of trash in proper receptacles
Fish Waste 	<ul style="list-style-type: none"> • Fish waste from boats or from dockside fish cleaning 	<ul style="list-style-type: none"> • Water contaminated by large amounts of fish waste suffer the same effects as the introduction of sewage and nutrients (see above) 	<ul style="list-style-type: none"> • Do not discard fish waste into marina water • Dispose of fish waste in appropriate trash or compost receptacles on land • Use fish cleaning stations to clean fish • Adopt catch and release fishing • Freeze fish parts and reuse them as bait

<p>Trash</p> 	<ul style="list-style-type: none"> • Illegally dumped or carelessly discarded into the water by recreational or commercial boaters • Carried by storm water runoff from urban landscapes • Discarded fishing lines and nets 	<ul style="list-style-type: none"> • Can contain materials that degrade water quality and are toxic to humans and aquatic life e.g. plastic, bacteria, metals, etc. • Kills fish, birds, aquatic mammals and other aquatic life etc. by entanglement or ingestion • Can pose an injury hazard to humans who come into contact with debris • Considered an aesthetic nuisance • Can impair enjoyment of beaches and waterways • Accumulates in waterways and in the ocean 	<ul style="list-style-type: none"> • Retain trash and food scraps on the boat to dispose on land into appropriate trash or compost receptacles dockside. • Reduce generation of trash by using biodegradable or non-disposable containers and food ware
<p>Untreated Sewage¹³</p> 	<ul style="list-style-type: none"> • Sewage from recreational and commercial boats • Pet waste carried by stormwater 	<ul style="list-style-type: none"> • Are sources of nitrates and phosphates as well (see <i>Nutrients</i>)above • Introduces disease-causing bacteria and pathogens into the water • Humans who come in contact with or swim in contaminated water can contract a wide variety of acute illnesses • Consumption of contaminated fish can cause illness as well 	<ul style="list-style-type: none"> • Do not discharge sewage in No Discharge Zones • Use sewage pumpouts • Install and properly maintain Type I, II or III Marine Sanitation Devices (MSD) • Ensure the Y-valve of the MSD is in closed position to prevent accidental discharge • Use restrooms on land to reduce boat toilet use • Avoid feeding wild birds at marinas as bird droppings can be a significant source of fecal contamination • Pet owners should pick up after pets and dispose into septic system or a trash receptacle
<p>Oil Dispersants¹²</p> 	<ul style="list-style-type: none"> • Used in cleaning up oil spills in the water • Often consist of surfactants • (see <i>Surfactants</i> below) 	<ul style="list-style-type: none"> • Breaks up oil into water-soluble micelles that rapidly dissolves into the water column effectively dispersing the oil over a larger volume of water • The effects of oil dispersants can have greater toxic effects than the original spilled oil 	<ul style="list-style-type: none"> • Use microbes to “eat” up the oil in the water; it is non-hazardous, nontoxic and biodegradable • Use absorption pads and booms • Avoid use of emulsifiers; it is illegal to use
<p>Surfactants²</p> 	<ul style="list-style-type: none"> • Detergents and cleaners 	<ul style="list-style-type: none"> • Reduces the surface tension of the water decreasing the dissolved oxygen concentration and impairing the breathing of fish • Surfactants can be toxic to aquatic life 	<ul style="list-style-type: none"> • Perform cleaning and maintenance out of the water in an area where the gray water will not enter the surface waters • For small topside cleaning jobs while the boat is in the water, use a bucket to rinse the towel or sponge rather than re-dipping it into the surface waters • Do not discharge gray water into the water • Retain gray water to pumpout or dispose of on land

<p>Petroleum Compounds (i.e. fuel, oil, and grease)^{2,13}</p> 	<ul style="list-style-type: none"> • Fueling station (drips from nozzles; overfilling) • Runoff from boat engine repair & maintenance areas • Storage tank leaks • Bilge oil discharges • Drips from engines, paint, draining oil, fuel from engines, grease, lubricant, finishes, and cleansers 	<ul style="list-style-type: none"> • Even small spills can contaminate large bodies of water • Spills causing a sheen is a violation of federal law and is punishable by fines and penalties • Impairs breathing for birds and aquatic organisms at the surface of the water • Can attach to plants impairing their photosynthesis • Can be ingested by aquatic life especially filter feeders such as oysters and sponges • Can harm juvenile fish and upset fish reproduction • As a sediment contaminant it can interfere with the growth and reproduction of bottom-dwelling organisms 	<ul style="list-style-type: none"> • Place absorbent booms around storm drains • Use donut ring or absorbent pads to catch spills during fueling • Check oil and fuel containers for leaks • Check engine for fuel leaks and use a drip pan under engines • Store oil and fuel containers in a covered area with secondary containment or a berm • Use absorbents pads to soak up oil in the bilge • Install and maintain air/fuel separators on air vents or tank stems of inboard fuel tanks to prevent fuel spills • Install and maintain a bilge pump with oil-water separation systems • Avoid use of detergent bilge cleaners
<p>PAHs - Polyaromatic Hydrocarbon^{8,14}</p> 	<ul style="list-style-type: none"> • Exhaust from boat motors • Paving sealants • Fuel spills • Creosote as a wood preservative 	<ul style="list-style-type: none"> • Can cause cancer • Can damage eyes, kidneys, and liver • Highly toxic to fish and other aquatic life 	<ul style="list-style-type: none"> • Avoid using creosote as a wood preservative • Reduce use of high-PAH paving sealants • Use 4-stroke engines instead of 2-stroke engines
<p>Solvents¹³</p> 	<ul style="list-style-type: none"> • Degreasing agents • Varnishes • Paint removers • Lacquers 	<ul style="list-style-type: none"> • Usually heavy, long chain compounds, they sink and accumulate in the sediment • Many solvents are considered VOC's (volatile organic compounds) which contribute to air pollution and adverse health effects (cancer, respiratory illness, and neurotoxicity) 	<ul style="list-style-type: none"> • Product Substitution – see <i>Purchasing Guide</i> • Avoid cleaning and maintenance while the boat is in the water • Use products that are non-aerosol, water-based, low VOC, non-toxic and biodegradable when possible
<p>Antifreeze³</p> 	<ul style="list-style-type: none"> • Bilge water contaminated with antifreeze • Leaks in the engine • Improper storage of antifreeze 	<ul style="list-style-type: none"> • It can be contaminated with fuel or heavy metals (e.g. lead) making it a hazardous waste • Water contaminated with ethylene glycol can be deadly to humans, pets, and aquatic life • Propylene glycol is a less toxic alternative for ethylene glycol although both are still toxic 	<ul style="list-style-type: none"> • Use propylene glycol (pink) instead of ethylene glycol (blue green) • Recycle antifreeze if possible • Dispose of antifreeze as hazardous waste in a separate labeled container
<p>Pesticides¹³</p> 	<ul style="list-style-type: none"> • Used on marina property and boat launch sites 	<ul style="list-style-type: none"> • Toxic to pets, small mammals, and aquatic life 	<ul style="list-style-type: none"> • Apply pesticide as directed by the label • Prevent pesticide from entering the water • Use low-toxic pesticides • Implement Integrated Pest Management techniques to reduce reliance on chemical pesticides e.g. use mulch for weed control

<p>Alkylphenol / Nonylphenol Ethoxylates (APE/NPE)^{8,9,12}</p> 	<ul style="list-style-type: none"> • Oil dispersants • Detergents, soaps, sanitizers • Degreasers and cleaners • Paints and plastics • Floor care products • Epoxy fillers 	<ul style="list-style-type: none"> • APE is hormone disruptor to humans and aquatic mammals • Does not readily degrade 	<ul style="list-style-type: none"> • Product substitution – see <i>Purchasing Guide</i> • Avoid discharging gray water into the water • Use the minimum amount of cleaner necessary • Use showers, sinks, and restroom facilities on land to reduce generation of gray water on the boat • Avoid topside cleaning while the boat is in the water
<p>Antimicrobial Products/ Triclosan^{8,10,11}</p> 	<ul style="list-style-type: none"> • Gray water containing: liquid hand soap, household cleaners, dishwashing liquid, cleaning products, toothpaste, hair products, plastics • Added as an anti-microbial agent to a variety of cleaning products¹⁷ 	<ul style="list-style-type: none"> • Triclosan is a hormone disruptor to humans and aquatic mammals • Triclosan undergoes bioaccumulation • Triclosan and other antimicrobials may be linked to the development of cancer and other adverse health effects in humans and mammals • The use of antimicrobials carries the potential for increasing antibiotic resistance 	<ul style="list-style-type: none"> • Product substitution – see <i>Purchasing Guide</i> • Avoid discharging gray water into the water • Use the minimum amount of cleaner necessary • Use showers, sinks, and restroom facilities on land to reduce generation of gray water on the boat • Avoid topside cleaning while the boat is in the water • Use bar soap for routine hand-washing
<p>Disinfectants for MSDs¹⁵</p> 	<ul style="list-style-type: none"> • Chemicals added to the MSD to treat sewage before discharge into the water such as: • Chlorine • Ammonia • Sodium hypochlorite or bleach • Formaldehyde 	<ul style="list-style-type: none"> • Chlorine, ammonia, bleach (sodium hypochlorite), formaldehyde, and other caustic chemicals are highly toxic to aquatic life if treated sewage is discharged into the water 	<ul style="list-style-type: none"> • Do not use disinfectants and MSD additives that contain these ingredients • Use environmentally friendly alternatives such as enzyme or bio-active treatments • Do not combine chemical treatments with other types of treatments as chemicals may harm the enzymes and bacteria • Do not discharge untreated sewage near shell beds, shallow coves, or recreational beaches
<p>Phthalates¹⁰</p> 	<ul style="list-style-type: none"> • Flexible & PVC/vinyl plastic • Food packaging and plastic bags • Building materials • Adhesives and caulks • Paints and pigments • Detergents • Solvents 	<ul style="list-style-type: none"> • Phthalates are a hormone disruptor • For males in particular, phthalates pose adverse health effects to reproductive systems and hormone levels 	<ul style="list-style-type: none"> • Product substitution – see <i>Purchasing Guide</i> • Use biodegradable food ware • Use re-usable containers and food ware
<p>Bisphenol A (BPA)¹⁰</p> 	<ul style="list-style-type: none"> • Hard plastics • Plastic water bottles • Plastic food ware • Lining of tin cans • Receipts 	<ul style="list-style-type: none"> • BPA is a hormone disruptor linked to infertility, miscarriage and reduced levels of an essential sex hormone in men. 	<ul style="list-style-type: none"> • Retain trash and food scraps on the boat to dispose on land into appropriate trash or compost receptacles dockside. • Reduce generation of trash by using biodegradable or re-usable containers and food ware

<p>Acidic/ Alkaline Solutions^{2,13}</p> 	<ul style="list-style-type: none"> • Detergents and cleaners containing strong acids and bases i.e. lye, bleach, and ammonia • Batteries • Grey water (clothes & dish washer, sinks, showers) 	<ul style="list-style-type: none"> • Alters the pH of the water • Toxic to aquatic life • Toxic to humans e.g. irritate or damage skin 	<ul style="list-style-type: none"> • Product substitution – see <i>Purchasing Guide</i> • Use the minimum amount of cleaner necessary • Use products that are non-aerosol, water-based, low VOC, non-toxic and biodegradable when possible • Avoid cleaning and maintenance while the boat is in the water • Dispose of batteries properly as hazardous waste • Do not discharge gray water into surface waters
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