

LINED LANDFILLS: "SMALL FLAWS CAN RESULT IN SIGNIFICANT LEAKS." In a paper by K.W. Brown and J.C. Thomas, published in the *Journal of Hazardous Materials*, (Vol. 18, pgs. 179-188, 1988), results of a study to evaluate the rates at which landfills leak through flaws in **flexible membrane liners (FML)** were presented. The paper also overviewed other studies documenting the nature of failures of lined landfills. "...The type of **FML** material made only a small difference with the polyvinylchloride (PVC) and chlorosulfonated polyethylene (CSPE) materials having a slightly slower flow rate than high density polyethylene (HDPE) and ethylene propylene rubber (EPDM) materials under similar conditions. The presence or absence of an underlying geotextile made no significant difference in leakage rate from an **FML**. The **FML** thickness did not significantly effect the leakage rate...Most facilities presently being constructed for the retention of hazardous liquids employ **FML** as the primary barrier for the retention of liquids. This drainage system serves both to indicate the presence of leaks in the overlying **FML** as well as to remove leachate, thus minimizing the potential for breaching the second underlying liner...**Bass et al** surveyed 27 lined facilities and found 12 failures at 10 sites. They documented the nature of the failures as including chemical attack of the **FML**, physical tears or punctures of the **FML** (5 of 12 sites), problems with field seaming or other field installation activities (1 to 3 of the 12 sites), and problems with gas bubbles. **Giroud** also surveyed 29 facilities and found defective seaming in the field to be the most frequent cause of **FML** failure. In addition, he concluded that leaks were a result of poor quality control of installation and improperly trained crews. **Kastman** during final inspection of a 60 mil **HDPE** liner installation measured two pinholes per 100 m (approx 109 yards) of seam, 2.3 specific cuts and punctures from unknown causes per 1000m² (approx 1200 square yards), and 27 rock proturbences per 1000² of sheet material." In their work **Brown and Thomas** estimate that "a single round hole with a diameter of 0.16 cm (approximately 1/16 inch) could easily be created by an underlying stone and under a 50 cm head (approx 20 inches liquid) would leak 1120m³ (approx 29,000 gallons per year)...The data also show the need for an effective quality control and assurance program during **FML** installation since small flaws can result in significant leaks." The title of the paper is **Leak rates into drainage systems underlying lined retention facilities**. (See also **Waste Not #3**, "On February 5, 1981, EPA states its opinion that all landfills will eventually leak.").

INCINERATORS: NEW SOURCES OF MERCURY CONTAMINATION IN THE GREAT LAKES. The sewage sludge incinerator cited in this article refers to the Duluth, Minnesota, Western Lake Superior Sanitary District incinerator. The incinerator burns 288 tpd of sewer sludge together with 120 tpd of municipal solid waste in RDF form. The incinerator was designed by **Consoer, Townsend & Assoc.** The following is from an article published in the International Joint Commission's newsletter, *Focus*, Nov-Dec, 1988, issue, and was written by Dr. Gary E. Glass, of the US EPA's Environmental Research Laboratory in Duluth, MN. "...Using a mass-balance approach, we started our study of the St. Louis River/Bay to locate sediment 'hot spots'. Our analytical methods were 'sharpened' to detect water mercury concentrations down to a part per trillion (ppt) bearing in mind the 12 ppt criterion based on the US EPA laboratory derived water quality criteria for mercury. Much to our surprise, our first sampling of the Superior and St. Louis Bays showed measurable values higher than the criterion, the highest values from samples near the waste water treatment plant. Samples from further up-river showed low ppt to non-detectable values in water. Further investigations this summer revealed that mercury concentrations in the St. Louis Bay near the treated wastewater discharge were constantly in excess of the mercury criterion and varied depending upon the plant flow operating conditions. **Water concentrations were higher when the sewage sludge incinerator was operating than when it was not.** During incinerator operation, the stack gasses are cooled and wet scrubbed with plant water. The scrubber water is returned to

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the wastewater input side of the plant increasing the mercury concentration of the sludge and the total mercury input load. Not all the mercury vapor from the incineration of sewage sludge is removed by scrubbing the combustion gas. Some is emitted from the stack as vapor to the atmosphere. In addition to the mercury content in the sludge, significant quantities of mercury are also present in the municipal refuse used to fuel the incinerator. This comes from disposable batteries, paints, inks, electrical components, etc. in household solid waste and accounts for at least half of the mercury inputs to the plant. The increased mercury concentrations in the St. Louis Bay River caused by incineration probably began in 1986; before that time the sludge was disposed of by land application and municipal refuse was landfilled. Incineration has become popular as a sludge disposal method and this process operates in 22 of the Areas of Concern. Mercury has been identified as an issue in 18 of these 22 areas, including the Lower Fox River-Green Bay tributary to Lake Michigan where sediment concentrations of mercury have increased by 45% over the last 10 years..." Copies of this article, "New sources of mercury contamination in the Great Lakes", are available from **Waste Not**. Please send a s.a.s.e.

NEW JERSEY: PAY-BY-BAG DISPOSAL PAYS. "In an effort to control disposal rates that have soared across most of the nation, High Bridge (a town of 4,000) has stopped charging households a flat \$280 annual fee for garbage collection. In January, the town began charging for the amount of trash residents actually discard. Each 30-gallon can or 30 gallon bag set out at curbside each week must carry a town sticker. Households are charged \$140 for 52 stickers, and additional stickers cost \$1.25 each. The switch to billing by the bag has also had an environmental impact reducing High Bridge's residential trash volume by 25%, officials say...the switch has heightened awareness of recycling programs for newspapers, aluminum cans and glass bottles and has ended careless ways at the kitchen trash bin...Some people whose garbage can is only two-thirds full on the eve of the weekly collection share their empty space with neighbors whose can is overflowing. 'I've heard of people taking bags of garbage home from parties to help the hostess out,' said Mary Briggs, the Town Council member who organized the new collection system. Trash compactors are going into more and more kitchens. And outdoor compost piles, common generations ago, are popping up in many yards. Since billing by the garbage bag started, the trash collected by the town truck has dropped to an average of 6.3 tons a day from 8.5...Under the new system, households that put out just one can a week pay only \$140; those that put out more buy more stickers in strips of 10 for \$12.50. Extra stickers are required for bulky disposal items, like stuffed chairs (2 stickers) and sofa beds (6)...'We wanted to throw out an old sofa, and they wanted four stickers on it,' said Janet Nazif. 'We didn't want to part with them, so we looked extra hard and found a school that wanted a used couch for a classroom.'" *New York Times*, 11-24-88.

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