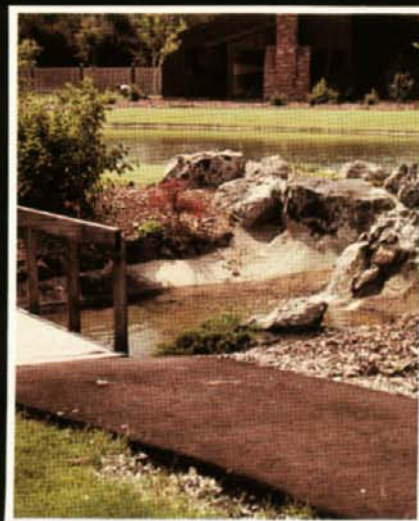
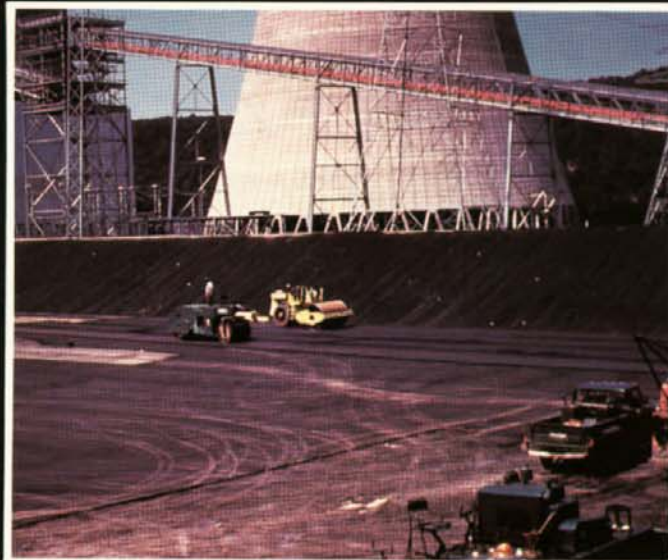


# Asphalt

for

# Environmental Liners



**...because whatever you put  
into a pond, reservoir,  
lagoon, or landfill  
you want to keep there!**



# Asphalt

was used for water-proofing long before it was used for load-bearing.

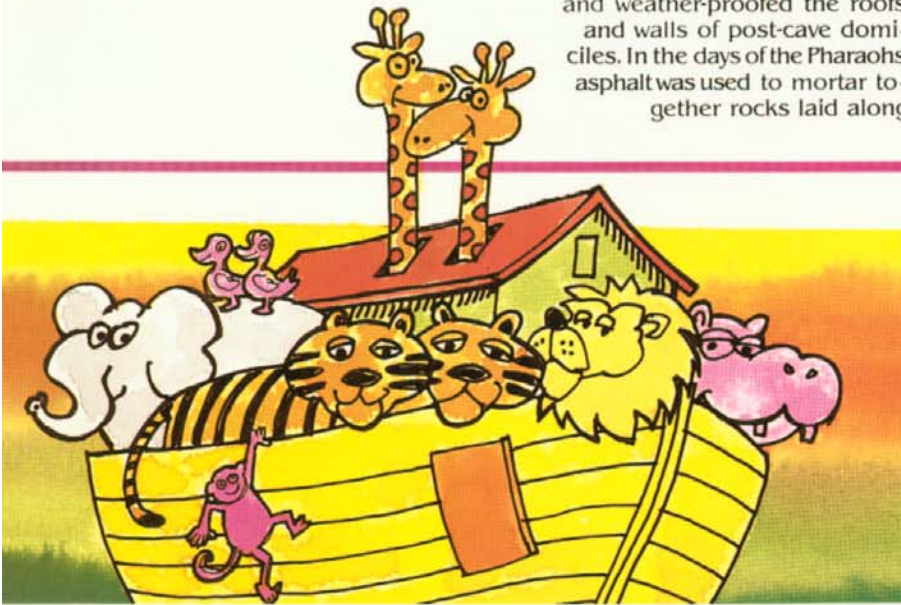
Thousands of years before. Asphalt, or "pitch" in its natural form, caulked the seams of the world's sailing ships and weather-proofed the roofs and walls of post-cave domiciles. In the days of the Pharaohs, asphalt was used to mortar together rocks laid along

their own baths, reservoirs and aqueducts.

It wasn't until comparatively recently that John MacAdam engineered modern road design and "paved the way" for the use of asphalt in its familiar load-bearing form.

Today, asphalt is again finding favor as a material for storing and processing all kinds of materials because it offers both essential properties—water-proofing and load-bearing.

Hot Mix Asphalt liners take on the toughest jobs—keeping sanitary landfills sanitary; storing toxic materials and preventing their escape into the surrounding environment; making it possible to treat and even recycle liquids and solid wastes; and, of course, keeping clean water clean. No other environmental/hydraulic lining material even comes close!



the banks of the Nile to prevent erosion. Even earlier, it was used by civilizations of Mesopotamia and the Indus Valley to water-proof temple baths and water tanks. Notorious for plagiarism, the Romans borrowed the idea for

1 Recycling and composting non-toxic waste materials by a natural drying process

2 At Ludington, Michigan, water storage facility, water pumped in during off hours is released to run electricity-generating turbines during peak hours





# All things considered, there's only one possible reason to use anything other than asphalt for your containment system.

You can guess this one possible "reason." A Hot Mix liner may cost more initially than natural materials or fabric membrane liners but it is more cost-effective in the long run and certainly the safest-and-surest liner you can use.

Spotting the competition that much of a head start . . . on paper, at least . . . let's see why Hot Mix Asphalt ends up far in front.

## **LIQUIDS** don't penetrate asphalt\*

Now, you may question this statement knowing that asphalt pavement on streets, roads, and parking lots especially seem vulnerable to certain liquids. But this vulnerability is only through cracks in the surface caused by oxidation combined with steady traffic. Used as a liner, there is little if any oxidation and, of course, no steady traffic. Furthermore, to virtually eliminate porosity, a higher percentage of asphaltic binder is used and the material more densely compacted. Generally, liner specifications require voids of less than 2.5 percent which is well within installation capabilities.

## **ASPHALT** pavement is puncture-proof

Membranes may do the job well enough, for a while. However, they suffer from a serious drawback—sharp objects may puncture them and constant abrasion may wear holes. Worse yet, you're not likely to become aware of leakage until considerable environmental damage has been done.

## **A HOT MIX** Asphalt liner will outlast anything it contains

There are two dimensions to the matter of staying power. First, your liner has to remain impermeable for as long as you want it to. Clays, for example, tend to break down and lose their leak-proof properties in time. Then you also face the problem of unwanted plant life taking over. Being inert and stable, Hot Mix Asphalt minds its own business.

Second, your liner may be subject to waves or currents, and it's always subject to vertical and lateral pressures. With its compressive strength and flexibility, Hot Mix Asphalt survives these hazards better than any other material.

## **ASPHALT** conforms to irregular surfaces

Environmental containment systems are, after all, basins with curves and undulations as well as flat surfaces. Ponds and lagoons, those used for storm water control and perhaps aesthetics, are liable to be deliberately irregular, with bumps and mounds along the bottom and sides, and a free-form shoreline. Here's another way Hot Mix Asphalt excels. It can be installed uniformly over almost any terrain configuration. (As you know, rigid liners have special problems with this!)

## **ITS** load-bearing properties makes asphalt easy to clean

Anyone with experience . . . perhaps sad experience . . . with any kind of long-term containment system realizes it has to be cleaned out periodically. No problem getting equipment in (and out!) over a Hot Mix Asphalt liner. Something else is worth pointing out. Because of extra compaction

during installation, the surface of a Hot Mix liner is smoother than usual which makes the actual cleaning process easier.

## **ASPHALT** won't join forces with waste materials\*

Asphalt can handle toxic materials normally difficult to store, including sludge, brine, coal slurry, and many acids. This means that whatever you put into your containment system stays there as is rather than chemically altered.



## **BEING** inert, asphalt doesn't taint drinking water

This is a specialized attribute but critical for reservoirs. Nothing generates uproar faster or more vocally than tangy or discolored drinking water! No wonder Hot Mix Asphalt has been lining reservoirs and dams for years.

*\*Certain petroleum solvents, however, can affect Hot Mix liners and other toxic liquids may affect certain types of aggregates.*



From all this it would seem that Hot Mix Asphalt liners survive everything short of an earthquake which, you can well believe, is no joke in certain locations. Neither are freeze-thaw cycles in northern areas. Both kinds of natural phenomena will destroy any material too fragile or rigid.

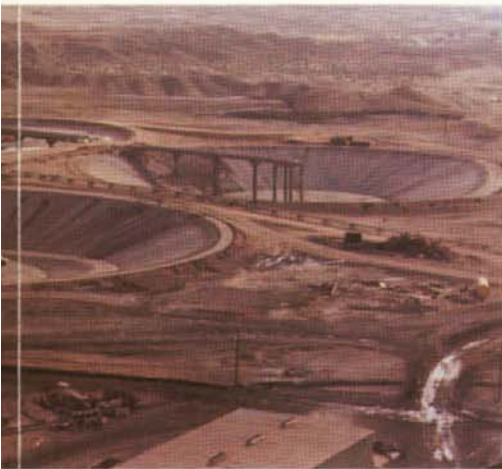
Asphalt will survive intact because it's *flexible*, able to absorb shocks and vibrations without losing its essential properties.

One further liner hazard—familiar to any property owner—is WEEDS. Vegetation can destroy a



liner faster and more thoroughly than any other enemy. Before installing any liner you should sterilize the underlying ground but even this preventive measure may not be enough. If your liner allows liquids to seep through, vegetation may again take root below and behind. Soon your liner springs leaks—lots of them!—the new growth enlarges the leaks, and, adding insult to injury, clogs the interior of your pond, lagoon, or reservoir.

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3 Active sewage aeration treatment facility

4 Four coal slurry storage ponds at Mohave Generating Station in Nevada

5 Asphalt lining underway at South Mountain Reservoir in the Phoenix, Arizona, area

6 Sewage treatment lagoon under construction in Union City, Michigan



## The EPA decision acknowledges landfill liner experience

Citing more than 300 "problem" landfills, some of them endangering the health of thousands of people, the Environmental Protection Agency (EPA) has banned the use of clay as a primary liner for both sanitary and hazardous waste landfills. EPA's view is that pollutants enter the pore structure of clay and eventually work their way through. Such liners may be water-retardant but hardly water-proof.

If natural materials and fabric membranes don't do the job, is there solid evidence that Hot Mix Asphalt does do the job? EPA thinks so, listing Hot Mix Asphalt as an acceptable liner for sanitary landfills, but let's see what experiences and results prove our contention.

**MORE** than ten years ago Pennsylvania was lining sanitary landfills with asphalt. Their standards are widely used in other states today.

### PENNSYLVANIA

was also a leader in developing "closed loop" treatment systems. A secondary pond collects leachates drained from the bottom of the primary pond. They can be kept and released from there or sprayed back over new effluents in the primary pond, collected and run through the loop again until ready for release. Hot Mix Asphalt lines the secondary pond as well since it does require frequent cleaning.

**HOT MIX** Asphalt replaced concrete years ago in the Ames, Iowa, Solid Waste Resource Recovery System, the first full-scale municipal facility producing refuse-derived fuel for an electric utility. The garbage contained so many jagged edges and abrasives that other liners—proprietary surface mixes, trap rock epoxy, and even metal-impregnated pcc—soon wore through. Finally, and in admitted desperation, they tried an asphalt overlay on one section. It worked so well they resurfaced the entire floor with asphalt and found it lasted two or three times as long as any other material. In the long run, asphalt proved about **FIVE TIMES LESS EXPENSIVE** than any other liner material.

**COAL** firms in Kentucky learned that Hot Mix Asphalt makes the ideal

*Sewage aeration lagoon at Westfield, New York, a typical small-community treatment facility*



## Hot Mix Asphalt is the answer for those unable to afford complete treatment facilities

Smaller companies and local governments are caught in the bind between having to treat waste materials effectively and being unable to afford a tertiary treatment facility and its associated chemicals.

base for coal storage piles at terminals. Asphalt contains the coal and provides a load-bearing surface for getting it in and out, and also keeps it from absorbing ground moisture.

**SPEAKING** of storing coal, coal slurry is one of the trickiest of all materials to store and recover of all organic fuels. It's messy and unsightly, and there's always the risk of fire if the coal dries out. The most effective system is a pond where the slurry stands until coal solids settle and excess water can be skimmed off the top. In Nevada, a 20-day coal storage system consists of four ponds about 400 feet across and 40 feet deep. Hot Mix Asphalt, of course, was the only practical liner . . . impermeable and strong.

*Sanitary landfill showing trench to collect and drain leachate into collection pond.*



Many communities have constructed aeration lagoons using asphalt as the liner, as the EPA suggests. A new approach is *aquaculture* whereby certain plants are used to reduce nitrogen and phosphorus. Indications are that a one-acre pond just three feet deep and lined with asphalt can treat the effluent generated by 500 people.

Now, organizations with limited means have an acceptable alternative to expensive treatment plants. They can even recoup some of their investment by harvesting the protein-rich plants—cattails, bullrushes, duckweed, or water hyacinths—and using them for animal feed.



# "Ponds make a great amenity but they're a pain in the...!"

Because developers of major residential, industrial, commercial, and business projects have to meet local environmental criteria for storm water management, they naturally think of ponds and the opportunity to combine retention with aesthetics. Any project is enhanced by a pond out front or a landscaped creek winding its way through the property. But nothing is more of a bother! Ponds and creeks have to be maintained and this raised the question as to how and for how much.

The "how" is easy. Hot Mix Asphalt meets all the design, installation, and maintenance criteria but what about aesthetics? Asphalt is still ideal. You can pave just below the surface and allow a natural shoreline. Many attractive ponds are *totally* lined with asphalt since it is compat-

ible with natural growth. It even fades obligingly when exposed to sun and air!

Asphalt offers yet another unique feature. It can be blended with different kinds and percentages of aggregate to allow some degree of porosity without loss of integrity. For example, porous asphalt acts as a water-permeable filter which permits some plant penetration without cracking.

The next time you drain your pond for cleaning, why not reline it with Hot Mix Asphalt? You'll like the ease of "how" and your tenants or customers who share the maintenance burden will like the lower "how much." Appearance-wise, everybody will be delighted!

**With its unparalleled combina-**

**tion of strength, durability, flexibility, resistance to hazardous materials, and, of course, impermeability, one might wonder why Hot Mix Asphalt hasn't been used all along to line containment systems. In a way, asphalt is the victim of its own success as the most popular roadway paving material. Its load-bearing attributes tend to obscure its original water-proofing attributes.**

**And, understandably, people have been inclined towards what they perceived as less-costly alternatives. That these alternatives don't work . . . as EPA points out . . . prompts us to take a closer look at Hot Mix Asphalt, to see it's the most cost-effective material for liners. Really the *only* material now.**

**napa** National  
Asphalt  
Pavement  
Association



*Asphalt-lined ponds combine water retention with aesthetics*

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