EnviroFacts
Environmental Management Directorate, Hill Air Force Base, Utah
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Berman Pond Asphalt Cap

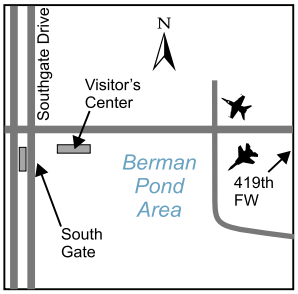
Drive through Hill AFB's South Gate and immediately to your right you will see a large, beautifully designed parking lot.

What's the big deal about a parking lot? It so happens that this parking lot won a prestigious design award. Why did a *parking lot* win an award? Because this is no ordinary slab of asphalt.

The parking lot is really part of a sophisticated environmental remediation system designed to keep water out of an old hazardous waste site that lies beneath the surface. This combination of form and function earned recognition from the Utah Consulting Engineers Council. Montgomery Watson, the Air Force's contractor on the project, was awarded the UCEC's Grand Conceptor Award for 1997. The cap has also been nominated for several other Air Force awards.

Site Background

Berman Pond, an old wastewater collection pond located near the South Gate, is one of Hill AFB's oldest hazardous waste sites. Long-since abandoned and replaced with modern wastewater collection and treatment systems, Berman Pond's legacy is a few old photographs, a plume of contaminated groundwater that stretches both on and off base and a multimillion dollar cleanup challenge for the Air Force.



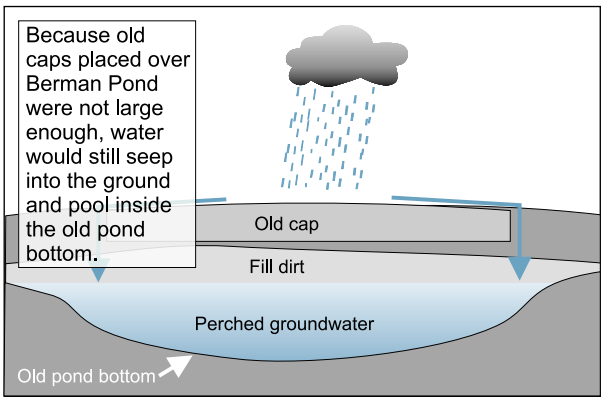
The Air Force's plan to deal with Berman Pond has been to remove contaminated groundwater in the area and cap the old pond site to prevent any additional water from entering the site.

A previous attempt to cap the site in 1986 was only partially successful. So in 1995, Hill engineers decided to replace the existing cap system with an entirely new cap. Working closely with the base civil engineers, the 419th Fighter Wing (which has its facilities located nearby), federal and state regulators and a team of engineers from Montgomery Watson, a new cap was designed, which would turn a relatively useless parcel of land into a large parking lot.

The project was completed in May of 1998.

Starting from scratch

Instead of trying to fix the existing cap, engineers decided to start fresh. They examined the old caps to try to determine what worked and what didn't. Using old aerial photographs taken when the pond was in operation, the engineers plotted the area of the pond. They found that the pond was actually much larger than anyone had previously thought.



Site Background

Berman Pond operated as a wastewater and stormwater collection and evaporation pond from 1940-1956. It received liquid wastes from the maintenance hangars and other areas of the base via a network of pipes and canals.

These types of ponds were common in both the military and private industry. When the base's first industrial wastewater treatment plant came on-line in 1956, most industrial wastes were diverted there.

Design criteria

In designing the cap, engineers were required to meet the following standards:

- The cap must keep water out of the pond area and meet the regulatory requirements for permeability.
- The cap must prevent people from coming into contact with contaminated soil.
- The cap design should allow the land to continue to be used.

This meant previous attempts at capping did not completely cover the pond, allowing water to seep into the area. Engineers knew that this cap must be designed to keep water out of the entire site.

Engineers also faced the challenge of designing a cap that would meet the base's needs. The base civil engineer was concerned that a large cap would cut off Foulois Road, the major traffic artery to the east side of the runway. Losing this road would require a major re-design of roads leading to the 419th Fighter Wing facilities, the golf course and other training facilities.

Taking these and numerous other considerations into account, the engineers decided the best solution would be to install a large asphalt cap that would cover all of the old pond. Most of the cap would be designed as a parking lot. But integrated into the parking lot would be a system of newly rerouted streets linking the 419th and Foulois Road to Southgate Avenue. The static display of the F-105 Thunderchief was joined by another static display of an F-16 Fighting Falcon, both of which belong to the 419th.

The design was approved by both base officials and environmental regulators from the Utah Department of Environmental Quality and the Environmental Protection Agency. Construction began in May of 1997.

Cap innovations

The Berman Pond cap is more than just a slab of asphalt. In fact, it's specially engineered to keep water out of the old pond area.

The eight-acre cap is built in three layers. At the base is an aggregate layer of graded rock and gravel laid on top of six inches of native material that has been dug up, and recompacted.

On top of the aggregate layer is the key to the cap's success—a two-inch layer of low-permeability asphalt. This asphalt is formulated with much finer materials than conventional asphalt and is specially designed to prevent water from penetrating it. The result is a cap that exceeds the regulatory standards for a cap by 10 to 100 times.

Unfortunately, this type of asphalt does not hold up well under the weight and stress of traffic. Therefore, engineers used a stone-matrix asphalt (see sidebar) for the topmost layer to handle the everyday wear and tear of traffic.

Beneath the roadways, where the weight of vehicles places a greater stress on the asphalt, the top layer is three inches thick and the base layer is 10 inches thick. In the parking areas, where there is much less traffic stress, the top layer is two inches thick and the base layer is six inches thick.

Cap's benefits

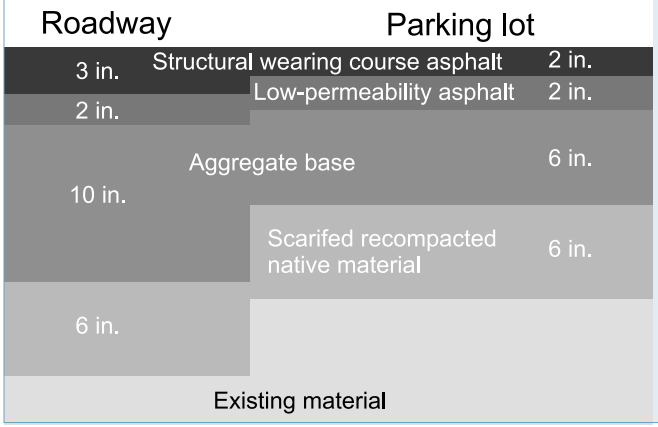
The purpose of a cap is not to actually clean up a site, but rather to keep the contamination from moving. It does this by keeping rainwater and snowmelt from seeping into and through the contaminated area. Water moving through a contaminated area tends to push the contaminants down to the water table, where they can be carried away from the site in the groundwater.

A cap cuts off this source of water from above, preventing contaminants from moving down toward the water table. As long as water is kept out of the site, the contamination is not likely to move. This is called source control.

At the Berman Pond site, the contamination has long since reached the groundwater and is moving away from the site. But now that the Berman Pond cap is in place, it should effectively eliminate the source of contamination that has been feeding the groundwater plumes for decades.

A cap is not the total solution to the problem. But source control makes other cleanup initiatives more effective, making it an important part of any cleanup strategy.

Cap Cross-Section



The Berman Pond cap is built in layers. The key to the cap is the second layer—the low-permeability asphalt layer, a specially formulated asphalt that prevents water from seeping through the cap. The top layer is a more conventional type of asphalt, designed to handle the wear and tear of traffic. The cap is thicker beneath the roadways to handle the additional weight and stress of traffic.

Coming through?

State regulations require a cap to have a permeability of less than 10^{-7} centimeters per second. That's less than 1¼ inches per year! Since the Berman Pond cap exceeds that standard it means it would take standing water nearly two years to penetrate the cap. Since the cap is sloped, water runs off quickly.

Where the rubber meets the road

The asphalt used for the topmost layer is a new type of material called Stone Matrix Asphalt (SMA). It was developed in Germany in the 1980s. It is routinely used in Europe as a paving surface for streets and highways and is gaining popularity in the U.S.

Although it is a little more expensive than conventional asphalt, engineers like it because it is less prone to rutting, holds together better in cold temperatures and does not soften as much in high temperatures.

Contact

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