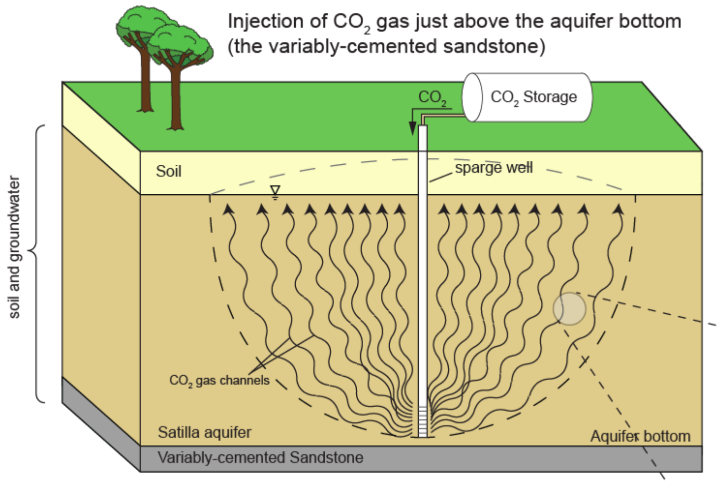
Glynn County Superfund Sites
CO2 Sparging Results Phase 1 for LCP Chemical Site, Brunswick, GA
September 2014

Background

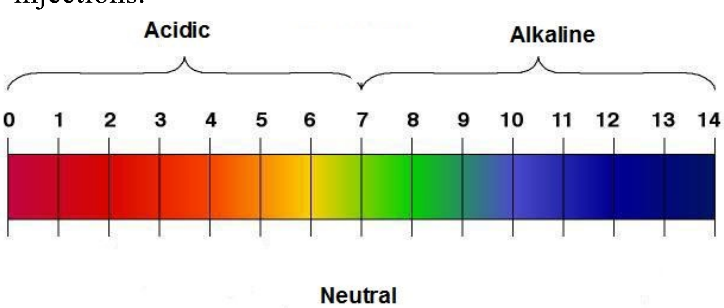
The LCP Chemical site's chemical contamination problems were caused by the former operations that produced caustic soda, chlorine, and hydrogen gas. The Cell Building leaked caustic soda into the groundwater below, making the groundwater caustic. Caustic water dissolves metals much more readily than water that has a neutral pH, and thus the water that was contaminated with the caustic waste also contains much higher levels of metals, especially mercury. Mercury can form methyl mercury, which is a form of mercury that is easily taken up by wildlife and stored in their tissues.



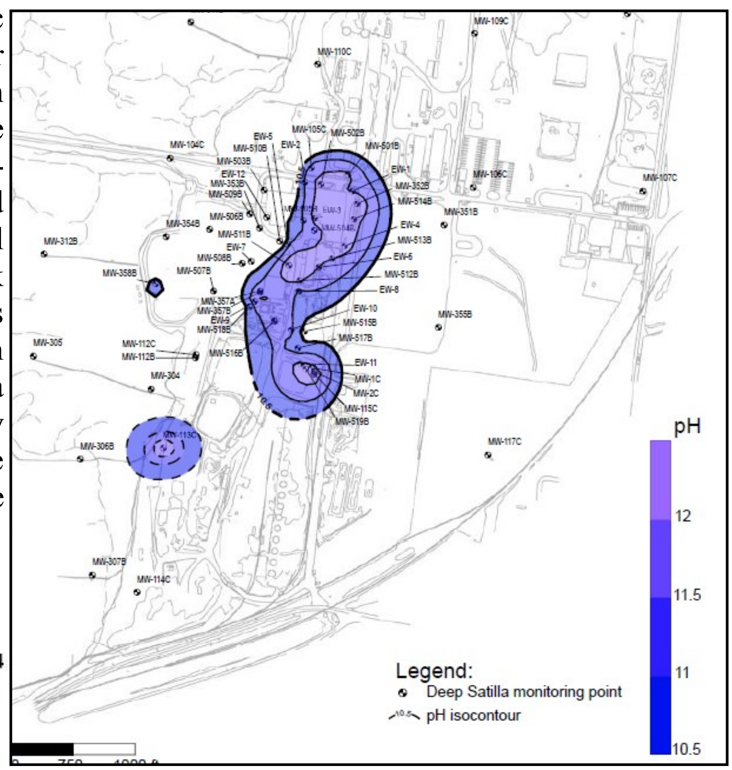
Carbon dioxide is stored on site and then injected deep into the ground. The carbon dioxide then moves up through the groundwater, lowering the pH of the water.

Treatment Method

The contaminated groundwater is called the Caustic Brine Pool because it was created when salty water and caustic soda leaked into the groundwater beneath the Cell Building. The method chosen to treat the Caustic Brine Pool uses carbon dioxide (CO2) to neutralize the caustic brine, which means they added something acidic to lower the pH to a more neutral point. Carbon dioxide is ideal because it forms a weak acid when it dissolves in water and no other chemicals are left behind and the acidity change does not happen too fast. This method was successfully tested on a small area of the Brine Pool before it was used to try and treat the entire Brine Pool over the past year. The latest report covers the results from the carbon dioxide injections.



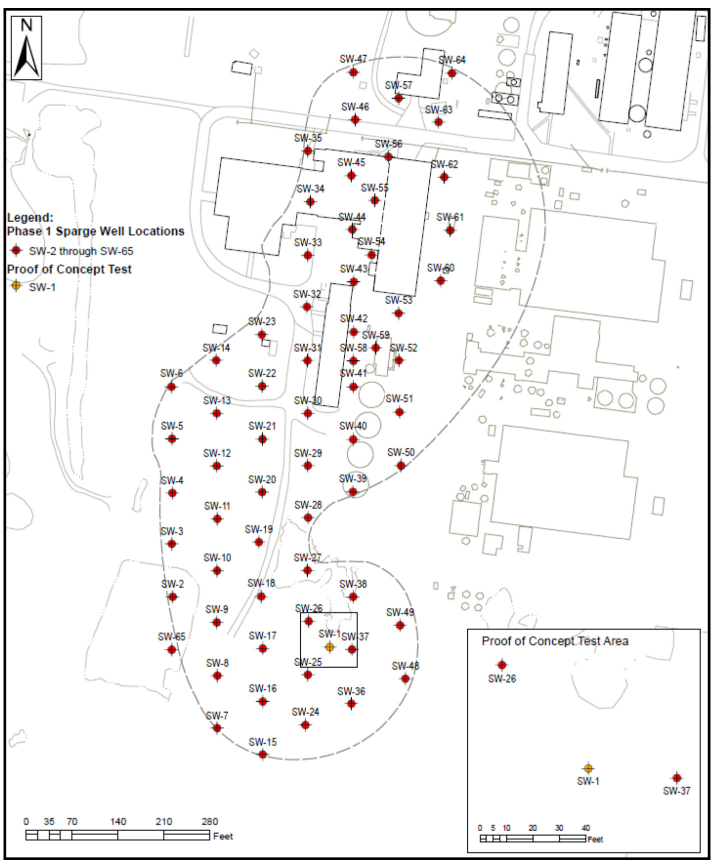
The pH scale above shows that water with a pH from 0 to 6 is acidic, a pH of 7 is neutral, and a pH from 8 to 14 is alkaline.



A map of the site showing the alkaline groundwater that makes up the Caustic Brine Pool. The pH of the groundwater before cleanup was greater than 10.5. Source: Figure 1-2, CO2 Sparging Phase 1 Report, (June 20, 2014), prepared by Mutch Associates, LLC

Top left: Typical sparge well. Top right: Portable CO_2 sparging system. Bottom: 50-ton CO2 storage tanks. Images are from Figure 2-6 of the CO2 Sparging Phase 1 Report (June 20, 2014), prepared by Mutch Associates, LLC.

The LCP site where the carbon dioxide storage tanks are located (inside red circle). Photo by James Holland



Locations of the 64 sparge wells installed as part of Phase 1 of CO_2 sparging. Source: Figure 2-1, CO_2 Sparging Phase 1 Report (June 20, 2014), prepared by Mutch Associates, LLC.

Results

A total of 64 wells were installed to inject the carbon dioxide treatment into the groundwater to treat the Caustic Brine Pool. Several monitoring wells were also installed to test the pH of the groundwater throughout the Caustic Brine Pool over the first full year of carbon dioxide injections.

The goal for Phase 1 operations was to lower the pH to between 10 and 10.5, reduce the density of the Caustic Brine Pool, and reduce the amount of dissolved mercury in groundwater.

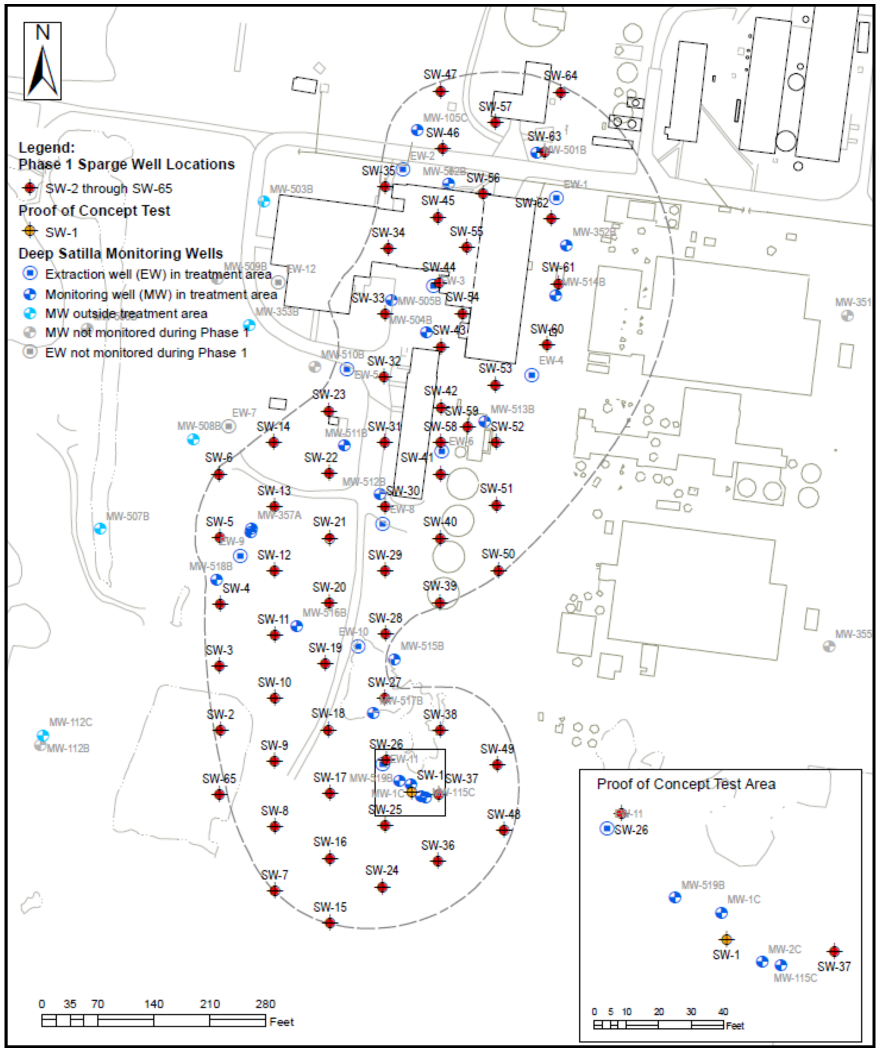
The majority of the monitoring wells that were within 30 feet of an injection well reached a pH less than 7.5. Those monitoring wells more than 30 feet from the closest injection well reached a pH of less than 10, but many were able to reach a pH less than 7.5. However, the deeper the groundwater, the higher the pH remained.

Mercury dissolved in groundwater was reduced just two weeks after carbon dioxide injections began and showed a 78% decrease overall. However, mercury was lowest where the groundwater pH was less than 7.5.

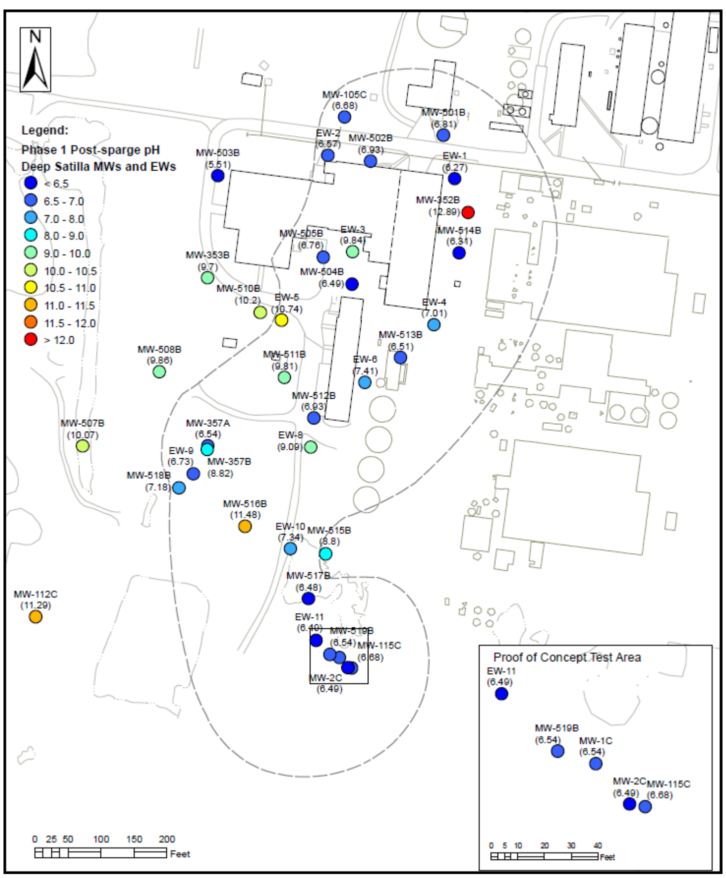
Phase 1 results have informed the actions to be taken during Phase 2, including the amount of carbon dioxide used, the duration and timing of the injection period, and additional pH monitoring to determine the need for additional wells.

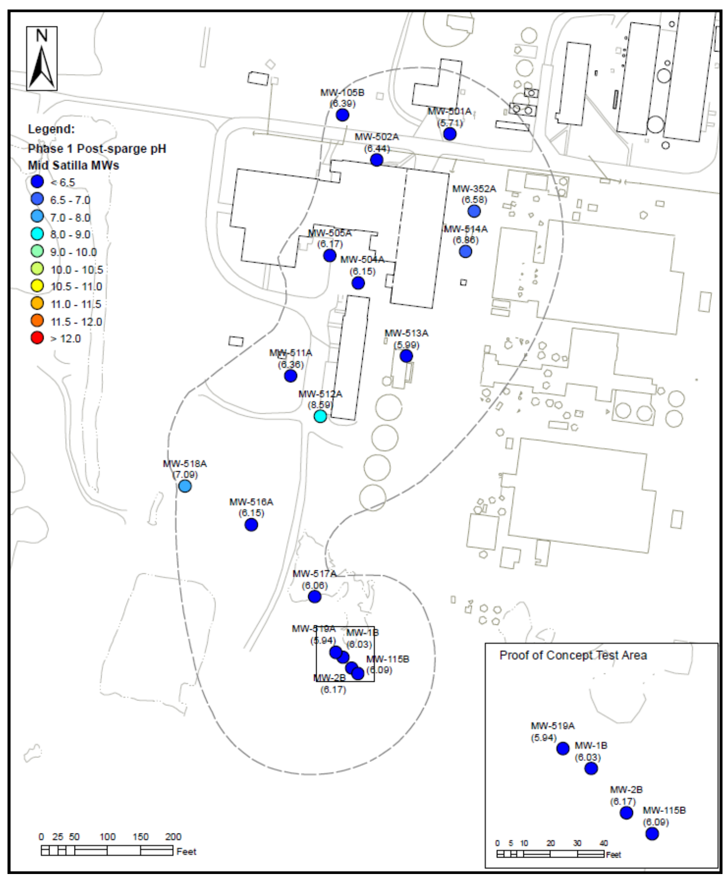
Conclusions

- Phase 1 was successful in reducing the pH of the groundwater
- The carbon dioxide still in the groundwater that has not escaped into the soil will continue to keep pH low and keep it from rebounding to a higher pH
- Additional testing of the pH months after the carbon dioxide injections stopped will give more information about how well the treatment works long term and will act as starting point before Phase 2 begins
- Once the pH of the groundwater is under control, cleanup of the mercury will be possible



Right: Injection wells (red) and monitoring wells (blue) at the Caustic Brine Pool. Bottom left: Deep groundwater pH levels at each monitoring well after a year of carbon dioxide injection. Bottom right: Mid-level groundwater pH levels at each monitoring well after a year of carbon dioxide injection. Source: Figure 2-2, Figure 4-24, and Figure 4-25, respectively, CO_2 Sparging Phase 1 Report (June 20, 2014), prepared by Mutch Associates, LLC.





Glynn Environmental Coalition
P. O. Box 2443
Brunswick, GA 31521

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www.glynnenvironmental.org

For more information, contact the Glynn Environmental Coalition

Phone: 912-466-0934

Email: gec@glynnenvironmental.org

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