Traditional Site Investigation and High-Resolution Investigation: Using the Right Tools for Deciphering a Hydrogeological Model

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Background/Objectives. A former metallurgical plant located in São Paulo downtown, Brazil, operated for over 50 years manufacturing small appliances. The plant was deactivated on 2005. Highly contaminated with chlorinated compounds from 2005 to 2015, the area was subjected to several investigation actions and remediation approaches (MPE, pump and treat, ISCO, ISCR). The objective was to redevelop it for residential use.

While the remediation technologies were tried, with no significant result, complementary investigation approaches were conducted. Direct and indirect investigation, hundreds of monitoring wells, dozens of MIP (Membrane Interface Probe) and HPT (Hydraulic Profiling Tool) points. Ten long years. Three different consultancy companies. No result.

The data we analyzed before starting the project was a bit disturbing, since some of the previous actions should have been much more efficient than the results gotten. Good technology has been being used so far, almost unlimited budget and poor, poor results.

Approach/Activities. Instead of starting from the point the last company failed, we went back to the beginning. The idea was not throw everything out and do everything again, but start thinking the case from the beginning, free from all the assumed models. All the existing investigation steps were followed by another more sophisticated and complex, and the result was the need of more and more information. We stopped this process. We knew we didn't need a big amount of new data, only some checking and a good and reliable geological, hydrogeological, stratigraphic understanding to fit all the tons of existing data into.

We made some boreholes close to the MIP/HPT points. The drill logs were described inch by inch and we ended up on a very sharp stratigraphic model. The clay levels were so compact and thick that shown no humidity inside, even below groundwater surface. In general, the MIP/HTP points went no more than 15 meters deep, stopping in this clay level. But we also identified some thin (0.5 to 1.0 meter thick) highly permeable horizontal sand levels. These permeable levels are not connected in the area. This structure and these sand layers weren't identified in the past studies. The plumes were all wrong, based on the clay level occurrence only.

Additional 420 subsurface soil gas survey points, 200 drilling points and 182 monitoring wells were performed. All data was treated on a mathematical model.

With the stratigraphic model defined, the existing monitoring wells were all re-installed following the permeable sand level layers' model and finally we got a consistent plume distribution.

Now, with the correct hydrogeological model established, the plume distribution well defined and delineated, it was possible to design the remediation for a successful approach. We decided to use ISCR, although it was used before with no success, but now, injecting in the correct layers, using the correct equipment and most important, using a reagent with the right particle sizes to allow its injection in the targeted layers.

Results/Lessons Learned. There is a tendency in relying the site understanding to the use of

expensive high resolution investigation methods and the acquisition of big amounts of data. In this case, we clearly show that the site's hydrogeological model was defined by very traditional and cheap investigation tools, and good hydrogeologists expertize. All the existing information was used, but to confirm the model, since they fit perfectly in the new hydrogeological model. The client "lost" 10 years and several millions in this process. Our project was finished in 6 months with the remediation design.