



Site Remediation: „Getting Our Act Right“

A Case History

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Contaminated Sites*

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Environmental Management *Yesterday*

- **Limited knowledge** of environmental impact of contaminants
- Policy of **non-interference** in corporate management decisions (incl. waste)
- Comparatively high public **acceptance of risks** (safety and environment)
- **Costs** usually of **higher priority** than environmental concerns
- Authorities more **tolerant** towards malpractices



Man-made Environmental Incidents with Global Impact

- **London “Smog” (UK)**
- **Minamata (Japan)**
- **Seveso (Italy)**
- **Love Canal (USA)**
- **Schweizerhalle (Switzerland)**
- **Exxon Valdez (USA)**
- **Abidjan (Ivory Coast)**
- **etc. ...**



Environmental Management *Today*

- The public at large, as well as the authorities, are **environmentally aware**
- Public **perception** of Corporations has changed (to the negative)
- Society's acceptance of non-voluntary risks is **decreasing**
- Expectations re **safety** and **quality** of products and services are **increasing**
- Corporate **accountability** is demanded at all times
- Competitors are rapid to **exploit weaknesses** (e.g. incidents, scandals)



Environmental Management *Today*

A responsible multinational company will

- ❖ **have a sound **environmental policy** in place**
- ❖ **adhere to **internationally recognized standards** in Second and Third World countries**
- ❖ **be accountable for its activities **anywhere** in the world**

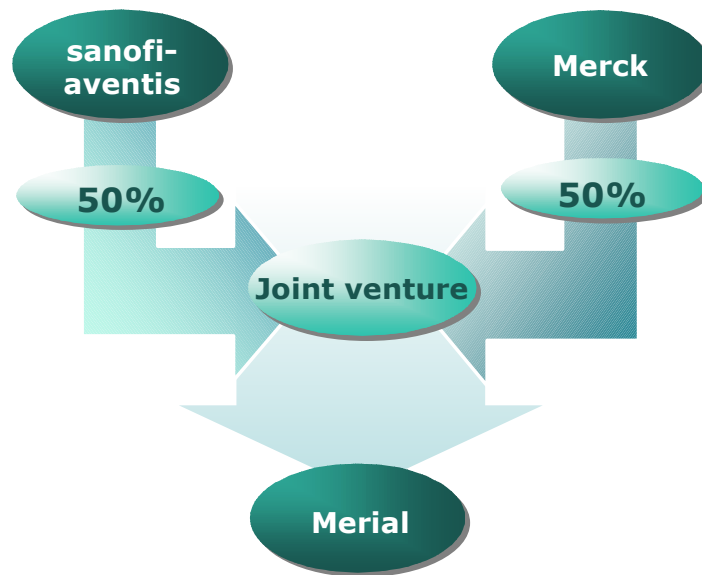
A company's assets may be threatened by an environmental incident!



Merial: The Company

At A Glance

Merial



A world leader in animal health

- Created August 1997
- 2005 Sales: US\$ 2bn
- Global business operating in more than 150 countries
- 5,000 employees worldwide



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A World-Leading
Animal Health Company



Case History

Merial Paulinia Site:

- Traces of **chlorinated solvents** found in ground water during a “due diligence” process
- **Buried drums** identified as source of pollution (no historical records found)
- Corporate decision to **inform** openly and to perform a **state-of-the-art** clean-up operation



Case History

Merial Paulinia Site:

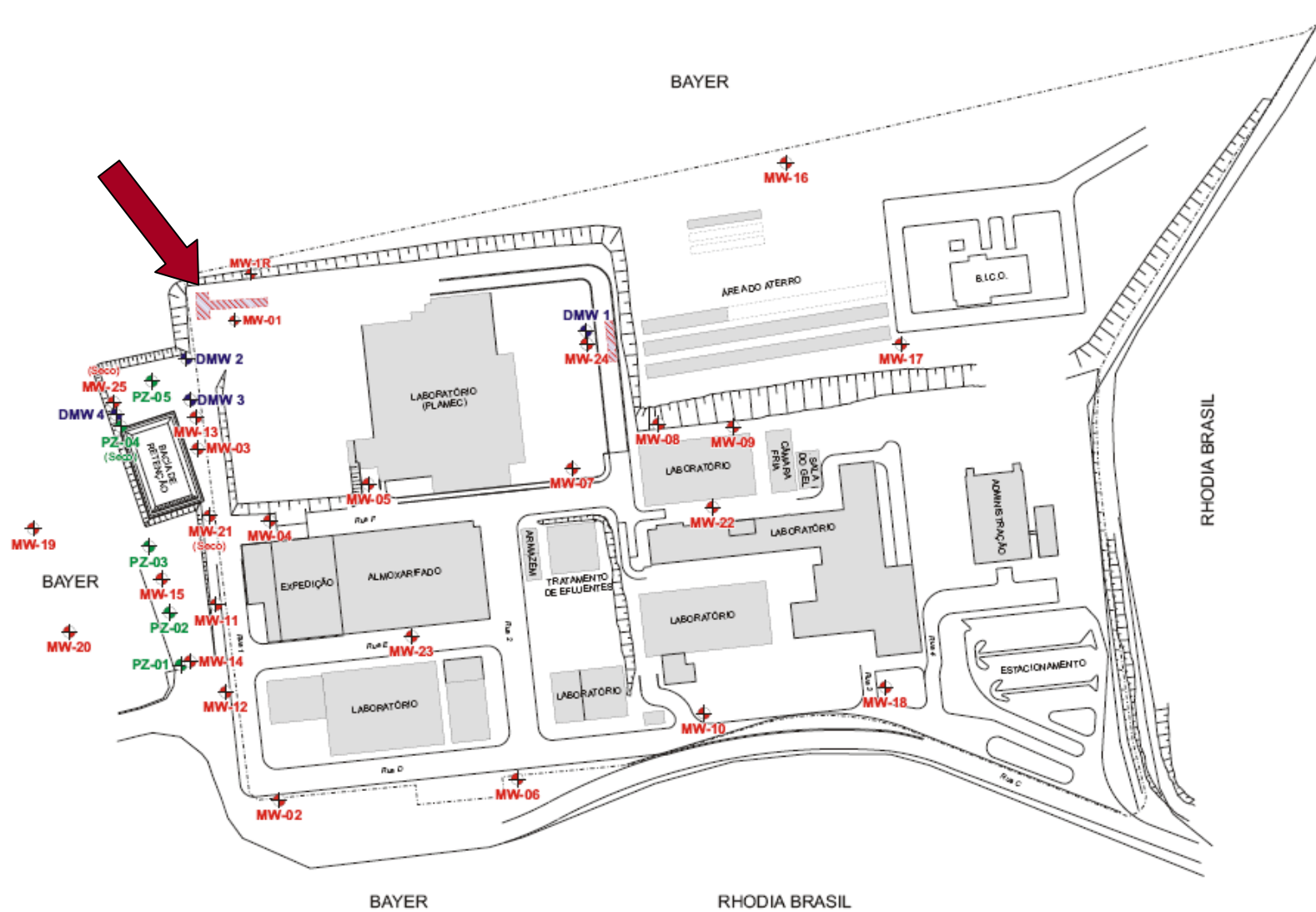
- **2000: analytical phase** started with US consulting company
- **2001: local consulting company ALS** hired for initial identification of **source** and **nature** of the contaminants
- **2003: Excavation** of buried drums (~ 10 t) and surrounding soil (~ 330 t); trench backfilled with clean soil (ALS)
- **End 2003: GEOKLOCK** hired for **detailed risk assessment**, planning of **clean-up** and development of **disposal plan**



Case History: Location of Contamination



Case History: Monitoring Plan



The Action Plan

Merial Paulinia Site:

- Formal **risk analysis** conducted on the basis of analytical data, using different computer models
- **Action plan** for the clean-up developed in **close cooperation** between Merial, GEOKLOCK and CETESB
- Requests by CETESB concerning **assessment, excavation and storage** of contaminated material were strictly followed



The Action Plan

Merial Paulinia Site:

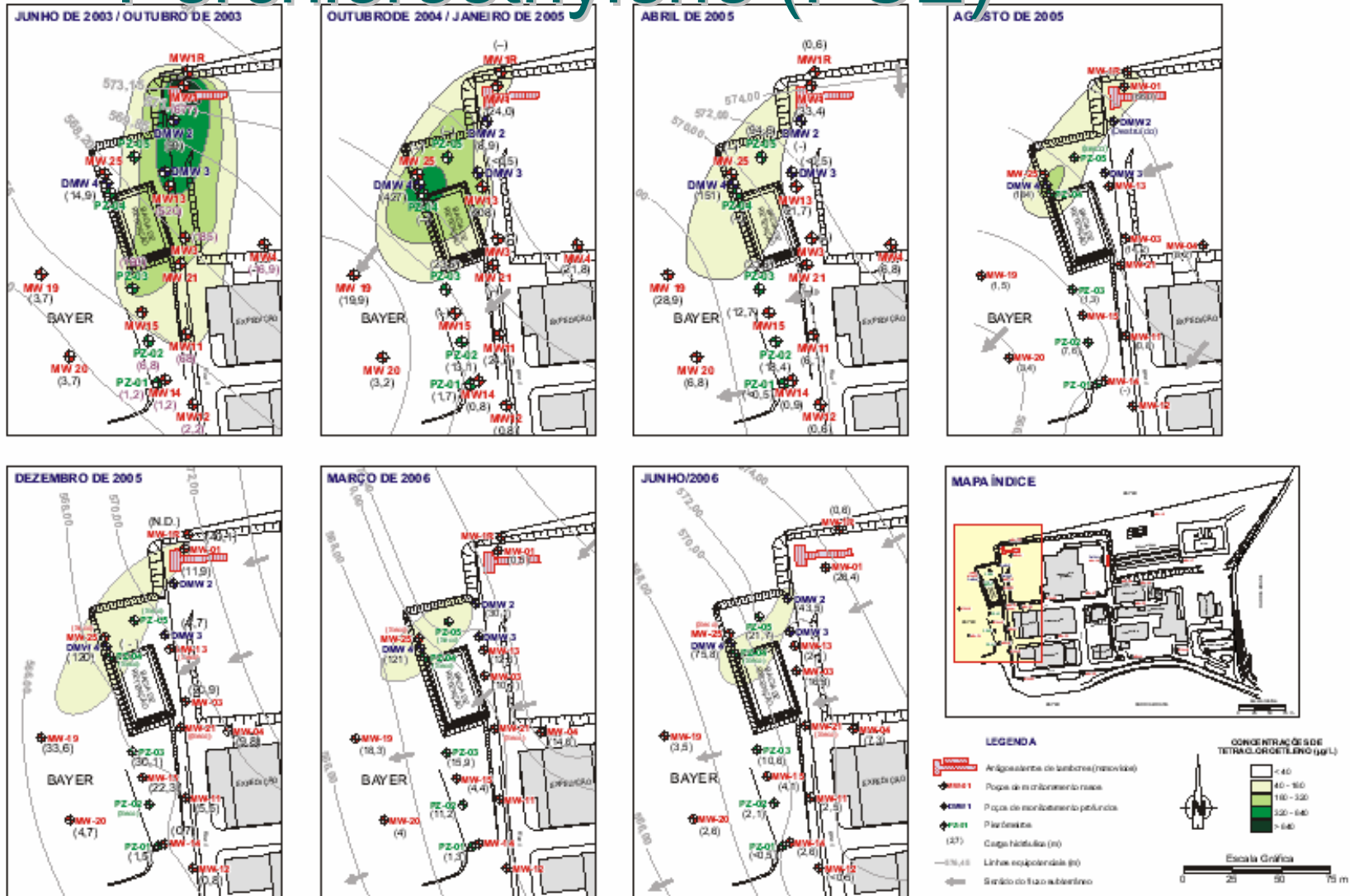
Action plan included

- a long-term **monitoring plan** to follow the future development of the plume
- a **contingency plan** in case the plume should move
- **open information** about size and nature of the plume

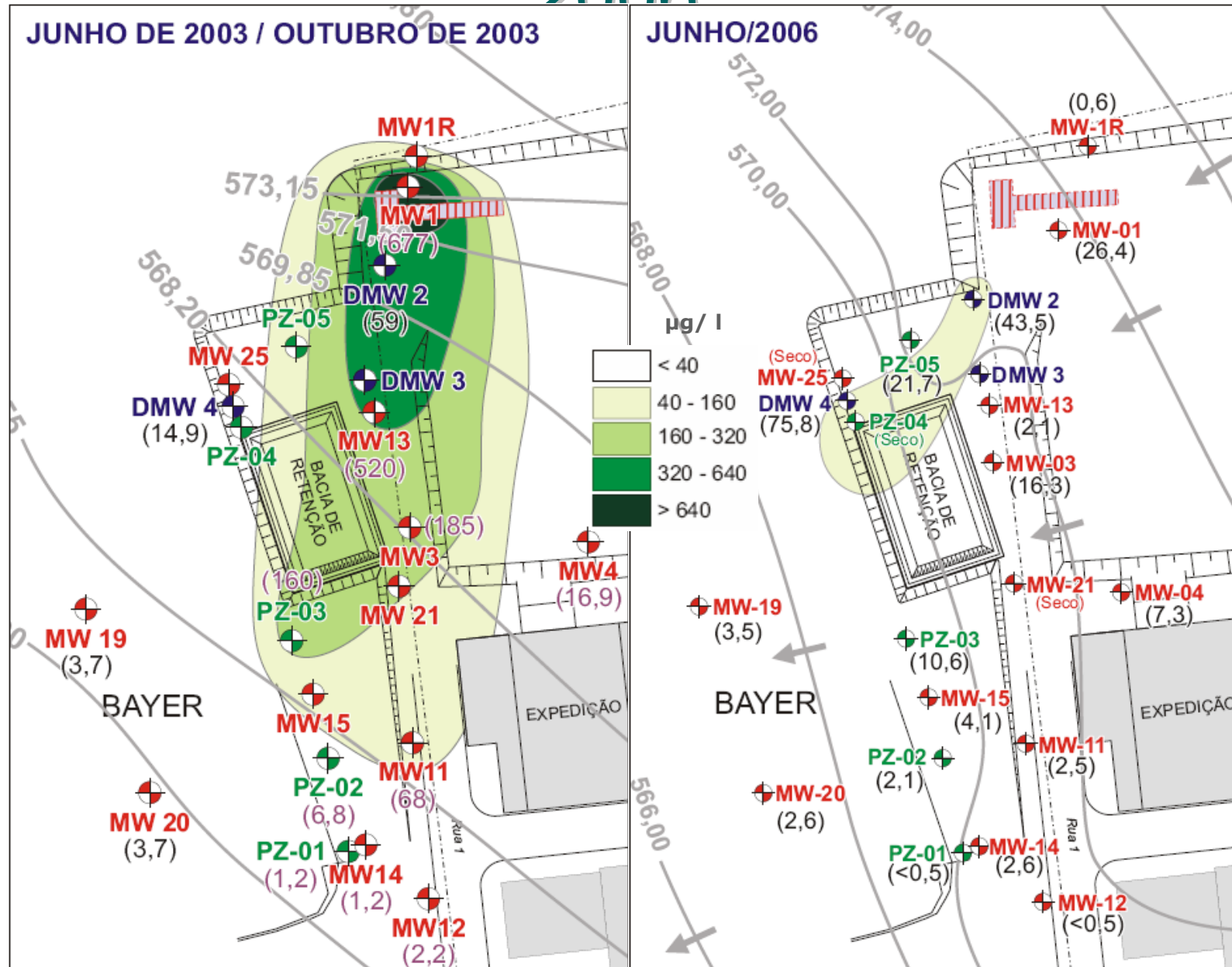
3-year monitoring results confirm that chemicals are gradually disappearing through natural attenuation !



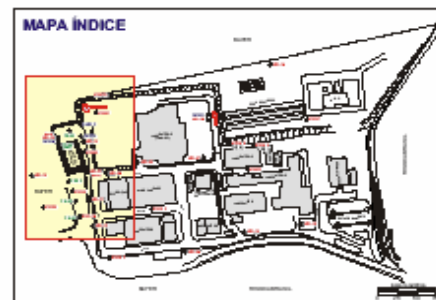
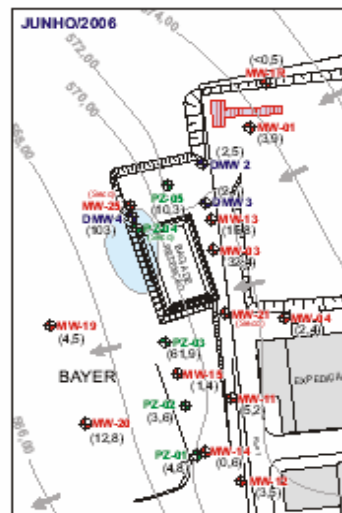
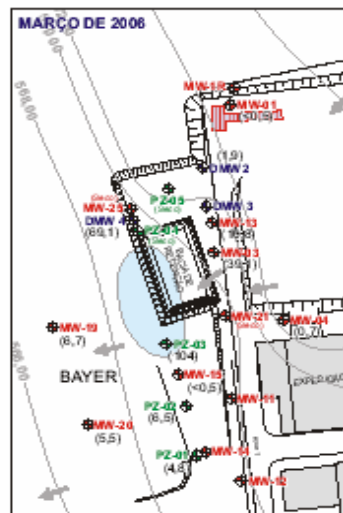
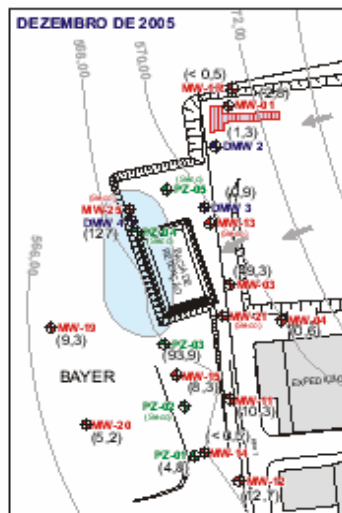
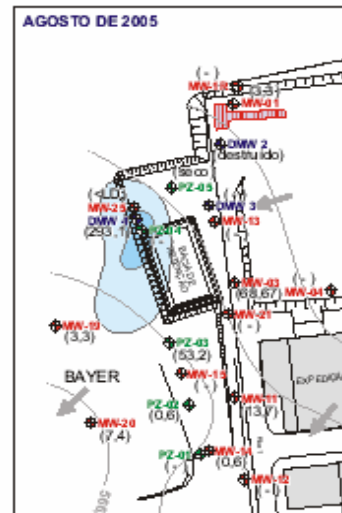
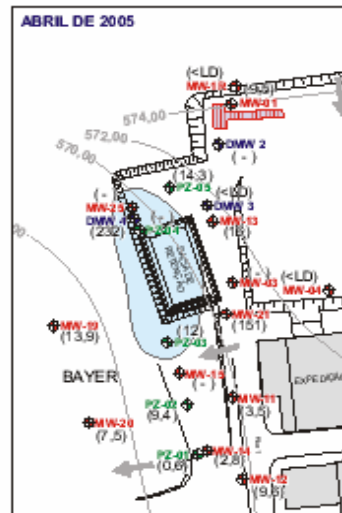
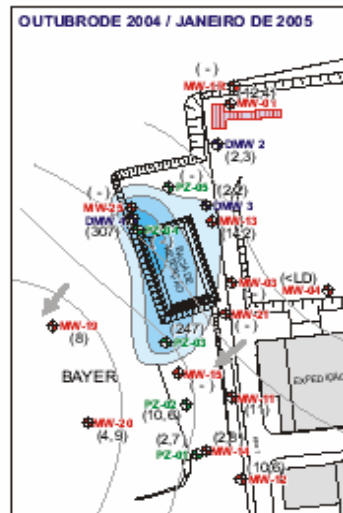
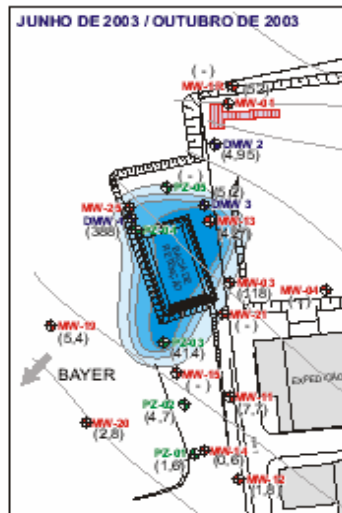
Natural Attenuation Perchloroethylene (PCE)



C₂H₂Cl₄ Plume Development 2003 - 2006



Natural Attenuation Chloroform (CHCl₃)



LEGENDA

- Antigos alvaros de tambores (renovados)
- Mapas de reforço rápido
- Mapas de monitoramento profundo
- Piezômetros
- Carga hidráulica (m)
- Linhas equipotenciais (v)
- Sentido do fluxo subterrâneo

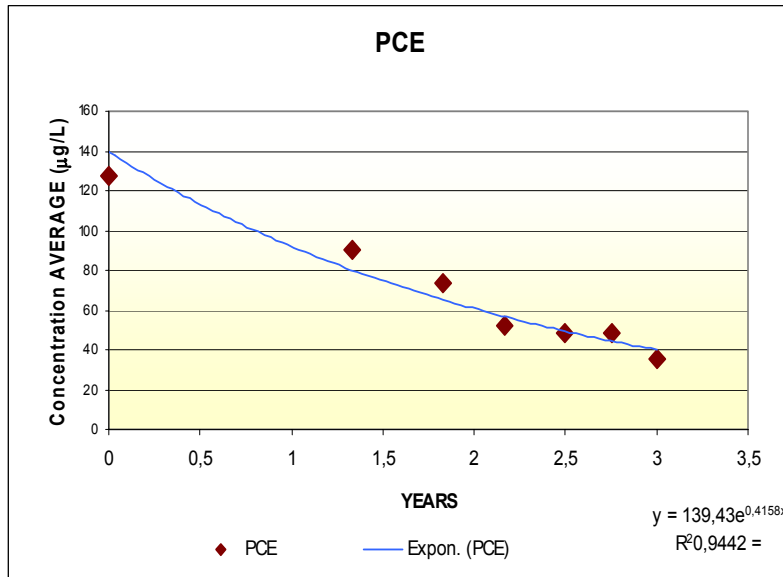
CONCENTRAÇÕES DE CLOROFORMO (µg/L)

- < 100
- 100 - 200
- 200 - 300
- 300 - 400
- > 400

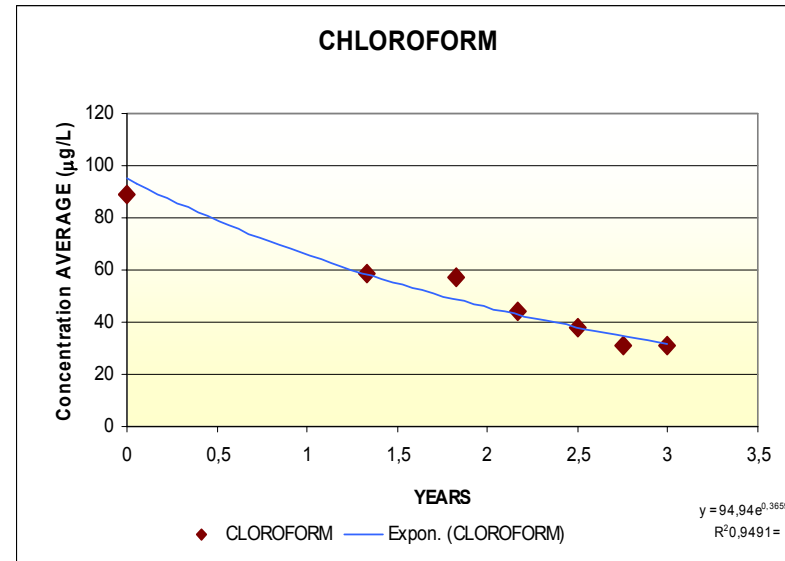
Escala Gráfica

0 25 50 75 m

Natural Attenuation – Half-lives of relevant compounds



$T_{1/2}(\text{PCE}): 1,7 \text{ YEARS}$



$T_{1/2}(\text{chloroform}): 1,9 \text{ YEARS}$



Case History

Current Status:

- The solid waste disposal plan is **awaiting final approval** by CETESB
- Excavated material will go either
 - to **approved landfills** or
 - to **co-processing** (cement kiln)
- **Regular monitoring** of the plume will continue, but no active remediation required
- **Contingency measures** (hydraulic barriers) can be quickly deployed if needed



Case History

Lessons Learnt:

- Competent **local** environmental consulting companies are **available**
- Data-based **risk analysis** is one of the most efficient ways to address environmental problems
- Close **cooperation** between the concerned parties facilitates **specific** and **cost-effective** remediation
- Robust solutions **benefit everyone**, in particular the **environment!**



Lessons learnt, hopefully!

