Managing Leachable Arsenic for Sustainable On-Site Soil Retention

Presented by Vanessa De Chellis
(Land & Water Consulting, South Australia, Australia)

Authored by Dr James Fox (Land & Water Consulting) and Richard Stewart (Ziltek)

Eleventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds
Site/ Project Setting

➢ State government project
➢ Construction of a new bus depot
➢ Former railyard
➢ Heavily contaminated site
Back in the day...
Back in the day...
Required End Product

- Commercial/industrial
- Bus facility
- Sealed level site
The Problem

- Dig and dump ~ 2,700m³ (95,400ft³) of contaminated soil
- USD$2.5 Mil taxpayer
- Huge # truck movements
- NOT SUSTAINABLE
The Solution

➢ Robust Tier 2 assessment
➢ Treat highly contaminated soil
➢ Sacrifice clean natural soil
➢ Retain treated soils
➢ Save $2 Mil USD
➢ SUSTAINABLE

(less annoyed taxpayer)
# The Data

## Criterion Analyte Fill Type

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Analyte</th>
<th>Fill Type A</th>
<th>Fill Type B</th>
<th>Fill Type C</th>
<th>Fill Type D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological Investigation Levels</td>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Copper</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Health Investigation Levels</td>
<td>Arsenic</td>
<td>✓</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lead</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Risk Assessment for Commercial Industrial Land Use</td>
<td>OKAY</td>
<td>OKAY</td>
<td>TREAT</td>
<td>OKAY</td>
<td></td>
</tr>
</tbody>
</table>

Potential for arsenic leaching to groundwater.
The Plan

~1,200 m³ of arsenic impacted soil to be treated/retained on site

Natural soil to be disposed off-site as clean fill (save $$)

Design surface

Legend
- Fill type D
- Fill type C (requires treatment)
- Fill Type A
- Natural
RemBind™

- Patented powdered reagent
- Binds contaminant to soil particles
- Imobilisation of arsenic
- Reduces leaching risk
- Protective of ecological receptors
RemBind™ Treatment Benchscale

- Two representative samples (Fill C)
- RemBind™ added: 0%, 10%, 20% and 40%
- Arsenic leachability tested before and after treatment (TCLP - pH 5)
- Multi Extraction Phase (MEP) leachate testing
- RemBind™ reduced leachate at the 10% addition rate by >95%
On Site Constraints

- Space
- Time

..... The Continuum
Applying the RemBind™

Insert video if we have time
# Post Treatment Results

<table>
<thead>
<tr>
<th>Arsenic Concentrations</th>
<th>Guideline Criteria Met?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Weight</td>
<td>✓</td>
</tr>
<tr>
<td>Leachate (TCLP- pH5)</td>
<td>✓</td>
</tr>
</tbody>
</table>
The Lessons Learned

- Daily survey for materials balance
- Hard to replicate field test results
- Conservatively applied 15% RemBind™

In the Land of Treating Soil...Volume Estimation is King.
The Conclusions

- US$650 K (USD)
- Saved ~US$1.9 million on remediation
- Suitable for Commercial / Industrial Use
- Avoided >650 truck movements and associated carbon footprint
- Treatment effective <1 week
- Completed in 6 weeks

In Situ Stabilisation – A Pragmatic Solution for Tax Payers Everywhere
Thank you.

And you can get further info at:

www.lwconsulting.com.au

...and

www.ziltek.com.au
## Tier 2 Assessment

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Analyte</th>
<th>Fill Type A</th>
<th>Fill Type B</th>
<th>Fill Type C</th>
<th>Fill Type D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological Investigation Levels</td>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Copper</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Health Investigation Levels</td>
<td>Arsenic</td>
<td>✓</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lead</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Risk Assessment Commercial</td>
<td></td>
<td>OKAY</td>
<td>OKAY</td>
<td>TREAT</td>
<td>OKAY</td>
</tr>
<tr>
<td>Industrial Land Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>