

# RAPID ASSESSMENT OF A LARGE INDUSTRIAL MANUFACTURING SITE USING WMS-LU PASSIVE SOIL VAPOUR SAMPLERS

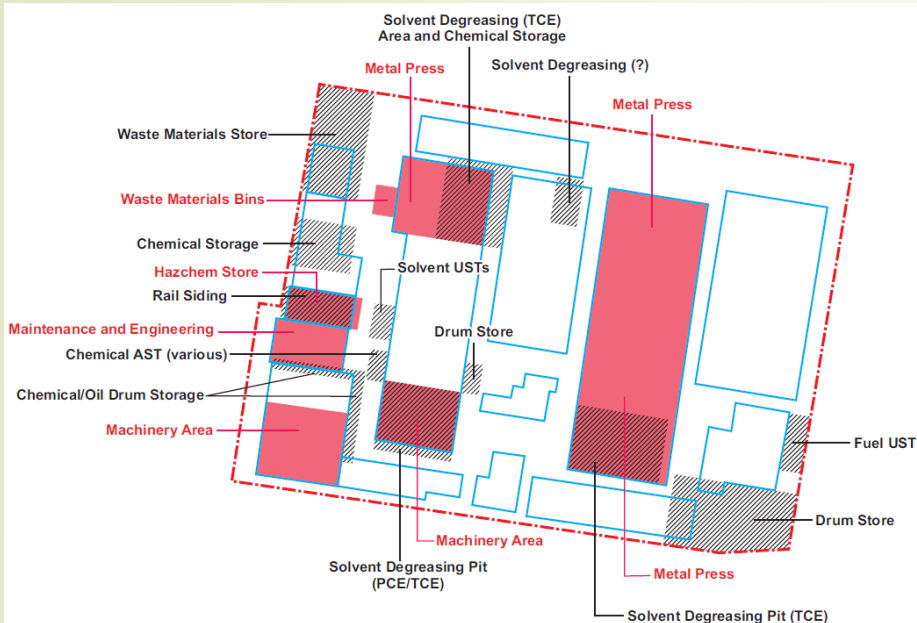
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## The Site



Current and Historical Potential Areas of Concern - Edge Group Pty Ltd, 2015

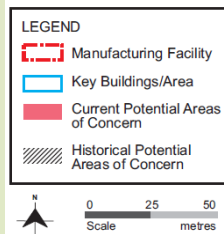


Image from [www.benefitspro.com](http://www.benefitspro.com)  
via Associated Press

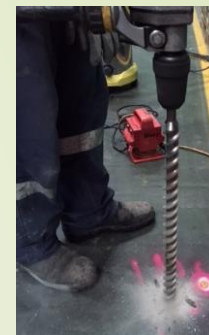


Image from [www.michigan.gov](http://www.michigan.gov)

- Large active manufacturing site (5 ha)
- Metal product manufacture since 1950
- Stratigraphy - hardcover / clays / basalt bedrock
- PCE and TCE chlorinated solvents used up to 1990's for liquid PCE (pit) and vapour TCE (enclosure) degreasing
- Other PCoC - Fuels, oils, greases and other VOCs used in manufacture processes
- > 20 potential current and historical source areas identified, but no known or recorded leaks/spills
- Limited groundwater investigation (4 wells) identified low level PCE and TCE impact in deep groundwater
- Potential risks to human health (soil vapour) and environment (water) identified
- Need to quickly identify source areas and contaminant types present

# The Approach

- Limited access, busy site, operates 24/7, many buildings and high traffic
- Conventional investigations = disruptive, time consuming and expensive
- Passive soil vapour (PSV) sampling offered a way to quickly assess site
- Comparative assessment of PSV technologies – WMS / AGI (Gore) / Beacon / Radiello
- Waterloo Membrane Sampler – Low Uptake (WMS-LU) selected
- Mixed grid and targeted approach
- Total of 73 sampling locations to 1.2 mbgl
- Largest single site deployment of WMS-LU samplers in Australia (as of March 2015)
- Additional small volume soil samples also collected to assess soil impact





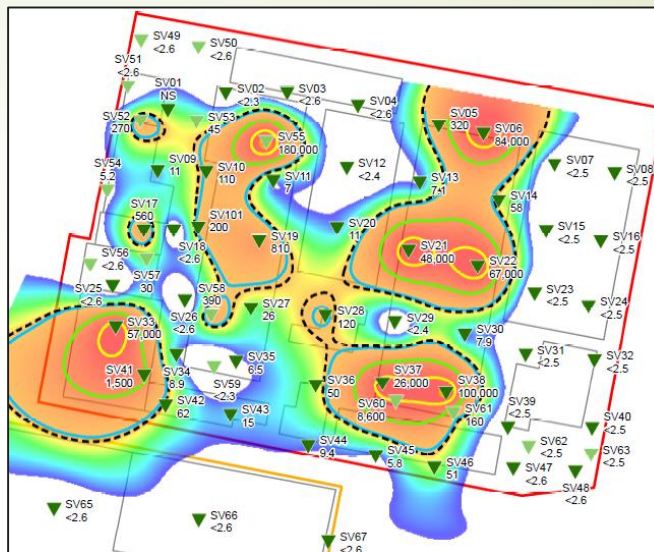
WMS-LU Sampler image - Edge Group Pty Ltd, 2015

## Why WMS-LU?

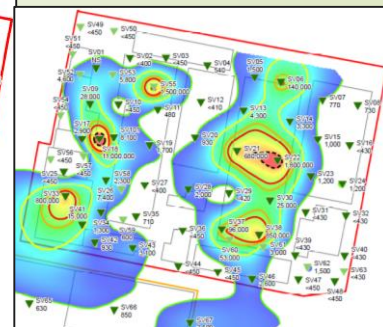
- Designed specifically for assessment of VOCs in vapour
- Significant research, data validation, peer review and application for assessment of soil vapour in US and Australia
- Supply and NATA accredited analysis of samplers by SGS Leeder Consulting (all in Australia)
- Key differentiator for client = Semi-quantitative results
- Samplers sensitive to all key PCoC and comparable results to active sampling
- WMS-LU low uptake rates suited to site conditions (basaltic clay)
- Low laboratory LOR for key PCoC – 14 day deployment to get low enough LORs for NEPM Interim HSLs
- Low cost - approx. 30% of cost of traditional methods
- Quick, low impact deployment (hand drill only) – 3 days
- Easy sample recovery and bore reinstatement – 2 days

# Results

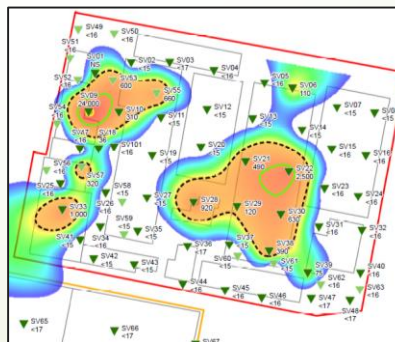
- Results identified criteria exceedances at 24 locations across site
- Maximum reported concentrations:
  - TCE - 180,000  $\mu\text{g}/\text{m}^3$
  - PCE - 150,000  $\mu\text{g}/\text{m}^3$
  - DCE - 198,000  $\mu\text{g}/\text{m}^3$
  - VC - 24,000  $\mu\text{g}/\text{m}^3$
  - TRH F1 - 11,000,000 (TRH)  $\mu\text{g}/\text{m}^3$
- Significant SV impact in manufacturing area – no off-site SV issues identified
- Exceedances dominated by TCE, but PCE, DCE, VC and TRH impacts also noted
- Edge and SiREM (Canada) collaborated to develop isopleth outputs to visualise the results
- A new data visualisation output for WMS-LU
- Only 2 locations had soil impacts – 1 TRH and 1 TCE/PCE and TRH



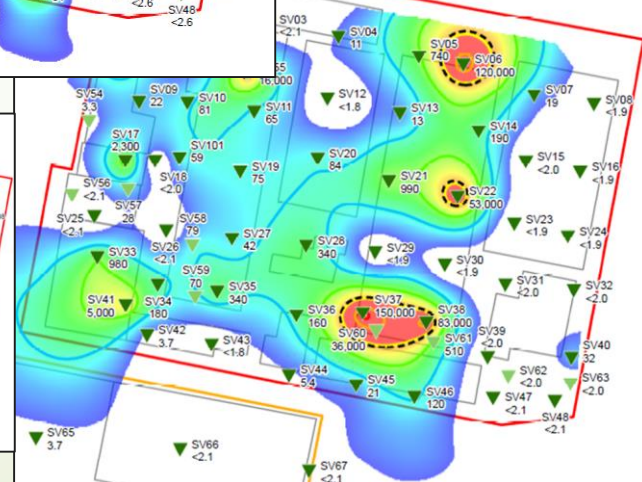
TCE Concentration in SV - SiREM, 2015



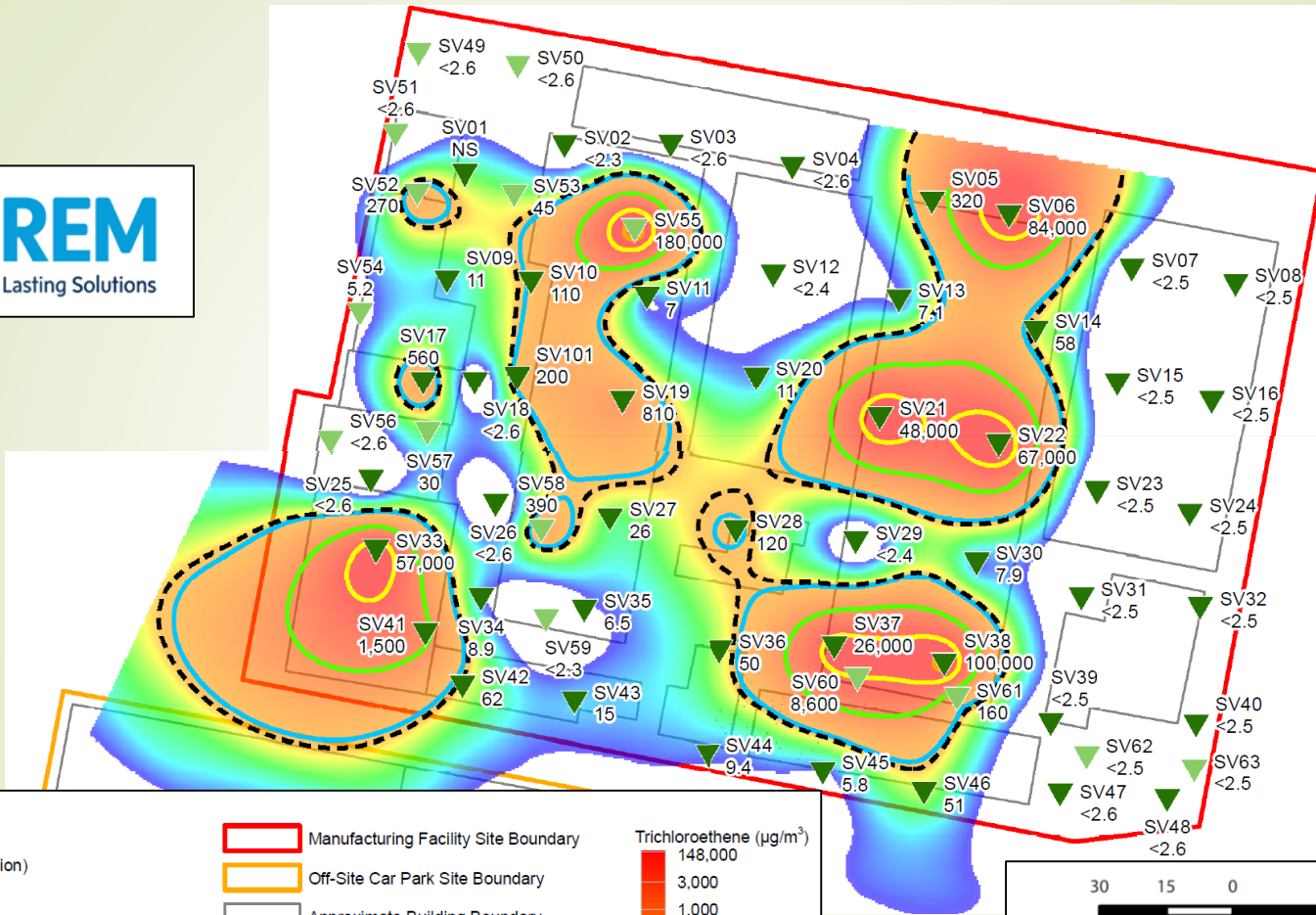
TRH F1 Concentration in SV - SiREM, 2015



VC Concentration in SV - SiREM, 2015



PCE Concentration in SV - SiREM, 2015



**Legend**

Trichloroethene ( $\mu\text{g}/\text{m}^3$ )

- 80 (Screening Criterion)
- 100
- 1,000
- 10,000
- 50,000
- 100,000
- 1,000,000


Manufacturing Facility Site Boundary  
 Off-Site Car Park Site Boundary  
 Approximate Building Boundary

▼ Passive Sampler Location - Grid ( $\mu\text{g}/\text{m}^3$ )  
▼ Passive Sampler Location - Targeted ( $\mu\text{g}/\text{m}^3$ )

Trichloroethene ( $\mu\text{g}/\text{m}^3$ )

- 148,000
- 3,000
- 1,000
- 300
- 100
- 30
- 10
- 8

30    15    0    30    60 Meters

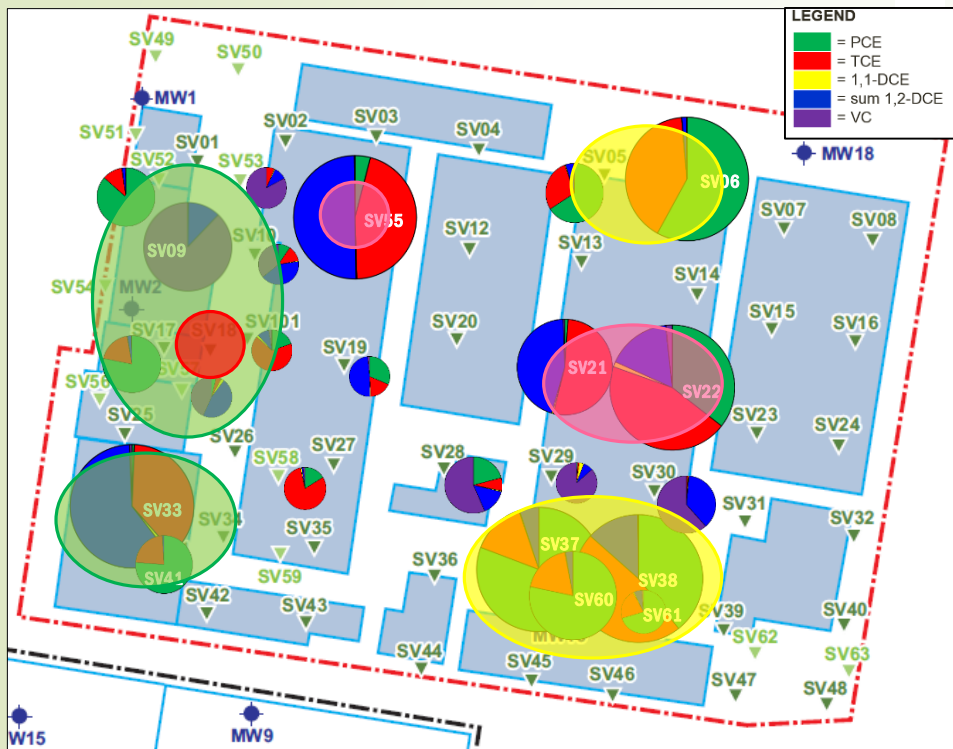


**TCE Concentration  
in Soil Gas**

Preliminary Passive Soil Vapour Assessment

## Conclusions

- Excellent correlation with 5 suspected source areas
- Identification of 2 previously unidentified source areas
- Relative percentages of contaminants suggest 4 impact types:
  - Mixed PCE and TCE;
  - PCE dominated;
  - TCE dominated; and
  - TRH.
- Impact types match known historical activities - PCE in pits, TCE in enclosures, others in storage areas
- Limited soil impacts noted suggest soil impacts highly localised
- Perched groundwater noted in some areas (leaking pipes and poor drainage) - may transport shallow dissolved phase impact and act as SV source
- Need to ascertain if SV is getting into indoor air



## Next Steps

- Verification of results using active (canister) SV sampling, Vapor Pins® and SV bores
- Targeted assessment and delineation of identified areas of SV and soil impact
- Benchmarking of initial WMS-LU data against active sampling data
- Indoor air monitoring – static and personal (assess SV to indoor air risks to site users)
- Assessment of perched groundwater on-site and deeper aquifer along down-gradient site boundary
- Ultimately, gather information to complete risk assessment for site users and potential off-site receptors



Image from [www.skinc.com](http://www.skinc.com)



Image from [www.geograph.ie](http://www.geograph.ie)

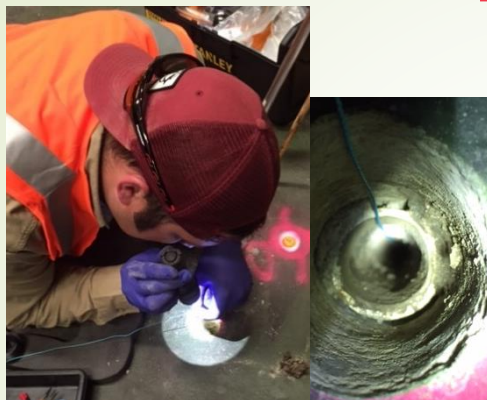


Image from [www.itrcweb.org](http://www.itrcweb.org)

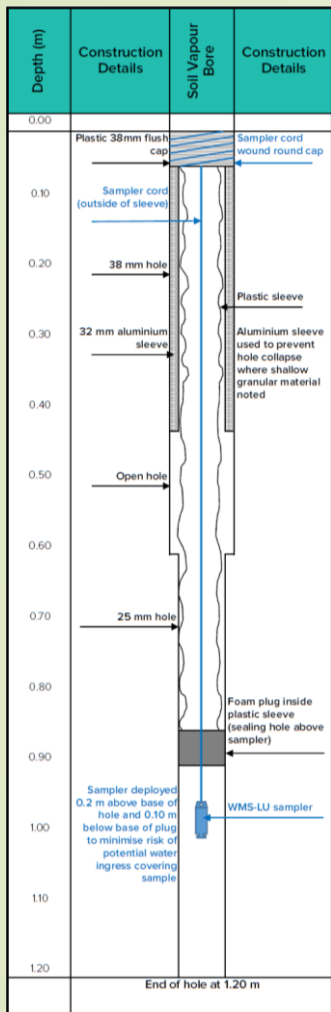


## Lessons Learnt

- Very simple and cost effective screening tool
- WMS-LU detects a wide range of contaminants (>30) across a very wide concentration range (1 to >10,000,000  $\mu\text{g}/\text{m}^3$ )
- Deploying the sampler, cord, plastic sleeve, foam block seal and capping through 35 / 25mm dia. hole can be tricky
- Caving in of loose sand and gravel – cased out with 35mm dia. aluminium sleeves
- Wet clays attract the WMS-LU samplers – stick to sides
- Making ‘bumpers’ is tricky – easy to break samplers – room for improvement
- Localised perched water welling into bores = submerged or saturated samplers
- BUT – moisture has a minimal effect on WMS-LU samplers (unless saturated)
- Knee pads are essential!



All images - Edge Group Pty Ltd, 2015



# THANKS TO

## Consultants – Australia and Canada



## Analytical



## Drillers



# QUESTIONS?

## Offline Questions/Queries

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