SCOTTISH CONTAMINATED LAND FORUM
SIGHTHILL TRA - SITE VISIT

8TH SEPTEMBER 2016
Introduction

Sighthill TRA, Glasgow
- Sweco involved in the project since 2012
- Remediation project delivery from exploratory SI to DQRA, with outline remediation design
- Various large scale historic industrial uses, in particular alkali manufacture ~ known galligu issue
- Extensive ongoing multi-disciplinary involvement - Contract 2, Contract 3 and beyond...

Galligu is a by-product of a process that converted rock salt into sodium carbonate. It is estimated that the production process produced 2t of galligu for every 1t of soda ash and at its height in the 1870s Britain’s soda output (about 200,000t annually) exceeded that of the rest of the world combined. The resulting millions of tonnes of waste galligu were either dumped into spoil heaps or spread on the ground surface to infill valleys or build embankments.
Sighthill TRA – Site Assessment

Multiple Phases of Site Investigation/Aessment
- Data review - multiple existing investigation datasets
  - > 10 years old
  - Not targeted to environmental assessment
  - Variable quality lab data
  - No clear identification of galligu waste in logs
- Exploratory SI - 2012
- Main SI - 2013
- Additional geotechnical and infill investigations in 2014 & 2015
- 12 rounds of gas and groundwater monitoring over 6 months
- Targeted gas clam and flux-box testing
- H₂S / Odour Surveys
- Large data volume
- Modelling and DQRA
Sighthill TRA - Modelling (1)

Delineating & Quantifying Galligu Deposits
- 3D Modelling using SI data
- Data uncertainty (previous SI)
- Interpretation/Refinement
  - Re-logging
  - Historic Maps / Photos
  - Galligu ‘signature’
  - Galligu Quantification - Holebase & AutoCAD Civil 3D
- Galligu volume >800,000m$^3$
Galligu Deposition
- Galligu heaps e.g. “Jack’s Mountain” either side of LMS rail
- Galligu interspersed with other fills
- Generally on boulder clay, but locally sitting on rock or on sands/gravels
- Thickest galligu under existing playing fields
- Significant reworking during construction of high-rise
- Potential for galligu pockets elsewhere
- Rail lines and “Stinky Ocean” infilled with variable materials
Sighthill TRA - DQRA

- Regulator Engagement - CLO / SEPA
- Site split into catchment areas (A, B, C, D)
- Key distinctions
  - Plume length
  - Hydraulic gradient
  - Saturated thickness
- Area-specific Remedial Targets
- 3 sets of RTC - covering shallow HH, vapour potential and WE risks
- Initial gas protection recommendations

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Units</th>
<th>GBH113 Area 1</th>
<th>GBH114 Area 1</th>
<th>GBH115 Area 2</th>
<th>GBH117 Area 3</th>
<th>GBH119</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>-</td>
<td>12.65</td>
<td>12.4</td>
<td>12.11</td>
<td>6.74</td>
<td>6.58</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/l</td>
<td>9577.4</td>
<td>770.2</td>
<td>313.8</td>
<td>17.3</td>
<td>64.8</td>
</tr>
<tr>
<td>Sulphide</td>
<td>μg/l</td>
<td>1961.440</td>
<td>290</td>
<td>0.088</td>
<td>&lt;10</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>
Sighthill TRA – Constraints (1)

Contaminated Land Constraints
- 30no. CoC
- Extensive & variable galligu wastes
- Hydrogen sulphide – preferential pathways
  ~ sewers and drainage mines
- Leachate reservoir “Stinky Ocean”
- Ground gas
- Localised hotspots
  - Various foundries/engineering works
  - Landfill / land raise (mixed waste)
  - Brick works
  - Gasworks
Sighthill TRA - Constraints (2)

Ecological and Engineering Constraints
- Protected Species / Invasive weeds
- Potential UXO
- Utilities
- Rail infrastructure
- Occupied properties & Schools
- Adjacent contracts
- Cultural heritage
Remediation Considerations

- Approximately 30 hotspots
- 50% Galligu, 50% other contaminants
- Ground gas risk and odour blight
- Long term durability
- Cost / Sustainability
Sighthill TRA - Outline Remediation Design (2)

Key Design Elements

– Galligu Containment
  – Barrier system
  – Localised basal seal
  – Capping
– Breaking preferential pathways – drainage mines and redundant sewers
– Progressive Investigation & Hotspot Delineation
– Hotspot remediation
– Short term and extended verification

Sweco Strategy ► Works Information for D&B Contract 1
Contact:
Alan Shepherd
Technical Manager
Transport, Landscape and Environment
Sweco

0131 550 6464
07828 842 084
alan.shepherd@sweco.co.uk